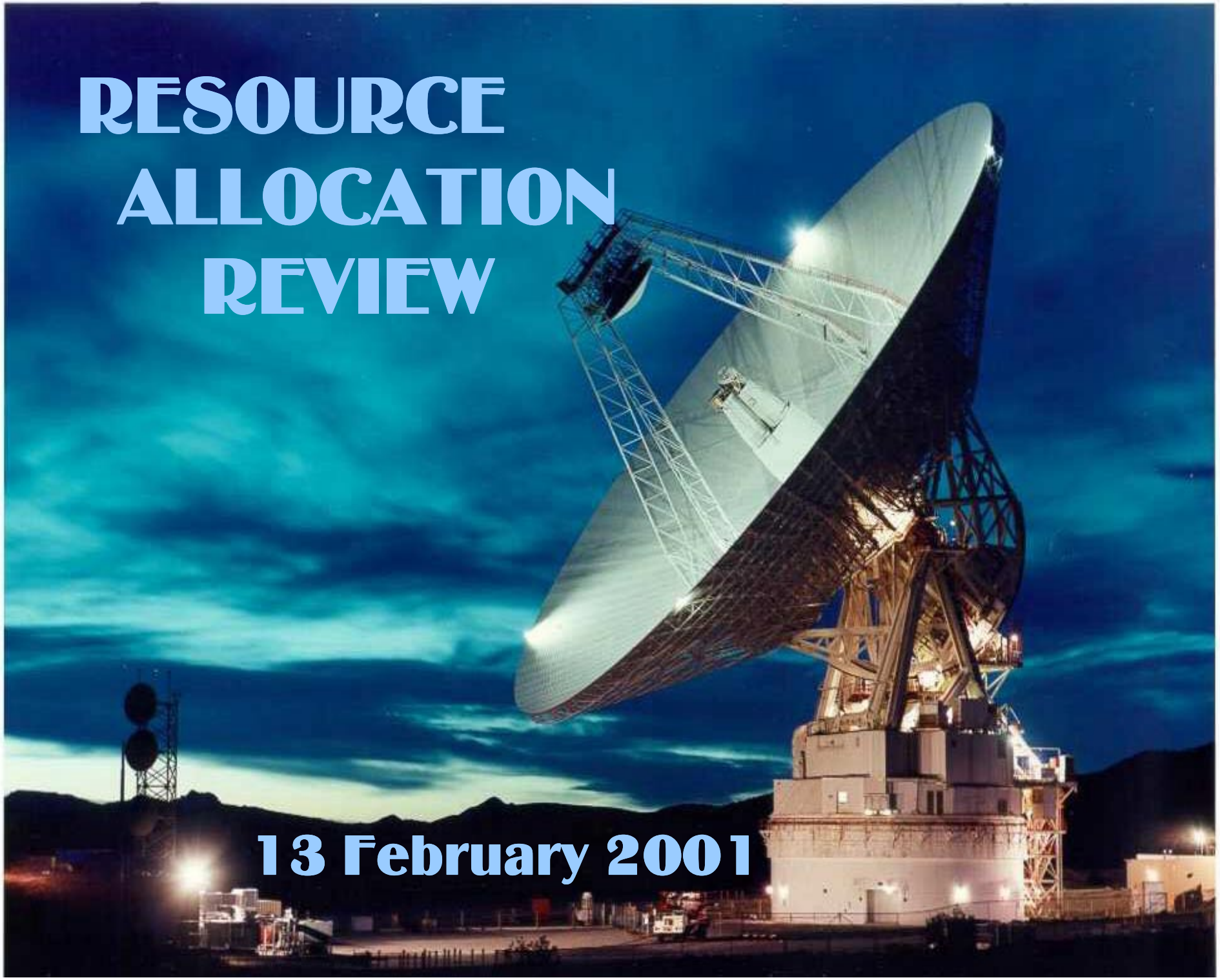
# RESOURCE ALLOCATION REVIEW



13 February 2001

**Jet Propulsion Laboratory**
California Institute of Technology

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Refer to: 930-01-04-ESB:mjs/lc

March 14, 2001

TO: Distribution

FROM: E. S. Burke

SUBJECT: 13 February 01 Resource Allocation Review Board (RARB) Meeting Minutes

The following are the minutes of the NASA/JPL Deep Space Network (DSN) Resource Allocation Review Board (RARB) Meeting held at JPL on 13 February 2001. The purpose of these Reviews is to address the over-subscription of the DSN 26/34/70-meter tracking assets. The Review Board consists of Project Managers, Project Scientists, and key JPL Telecommunications and Mission Operations Directorate (TMOD) managers, or their representatives. The Board is responsible for reviewing new or changed requirements, adopting recommendations to reduce periods of heavy contention, and for controlling changes of requirements.

The Review addressed contentions in the years 2002 and 2003.

***Review Board Members***

The following Review Board Members, or their representatives, were in attendance:

| | | |
|---|---|---|
| Gael Squibb | JPL | RARB Chairman / TMOD Director |
| Gene Burke | JPL | Resource Allocation Planning & Scheduling Office Mgr |
| Peter Beech | ESA (at JPL) | Ulysses Project Representative |
| Bill Blume | JPL | Deep Impact Project Representative |
| Michael Ebersole | JPL | SIRTF Project Manager Representative |
| Torrance Johnson | JPL | Galileo Project Scientist |
| Gail Klein | JPL | U.S. RosettaProject Representative |
| Mike Klein | JPL | Radio Astronomy Project Manager |
| Paolo Maldari | ESA | INTEGRAL Ground Segment Manager |
| Robert Mase | JPL | Mars 2001Odyssey Mission Representative |
| Ed Massey | JPL | Ulysses/Voyager Project Manager |
| Dennis Matson | JPL | Cassini Program Scientist |
| Steve Ostro | JPL | GSSR Project Scientist |
| Bob Ryan | JPL | Stardust Project Representative |
| Mark Ryne | JPL | Nozomi Project Representative |
| Chet Sasaki | JPL | Genesis Project Manager |
| Rance Skidmore | Omitron | GOES Project Manager Representative |
| Martin Slade | JPL | GSSR Project Manager |
| Ed Smith | JPL | Ulysses Project Scientist |
| Eileen Theilig | JPL | Galileo Project Manager |

| | | |
|---|---|---|
| Pete Theisinger | JPL | Mars Exploration Rover (MER) Project Manager |
| Joe Wackley | JPL | DSMS Operations Office Program Manager |
| Bill Worrall | GSFC | Orbiting Satellites Manager (ISTP, ACE, INTEGRAL) |
| Greg Wright | MSFC | Chandra Project Manager Representative |

***Review Materials***

The following items, covered in these minutes, include material in the bound handout, the *web-based "Red Book*," as well as presentations not provided until the day of the RARB:

1. Agenda
2. Introduction **B** G. Squibb, RARB Chair
3. Overview **B** G. Burke
4. DSMS DSN Implementation Status **B** K. Kimball (for J. Statman)
5. 26-meter Automation Task / Network Simplification Project **B** S. Kurtik
6. Mars Exploration Rover **B** P. Theisinger
7. Resource Contention Summary **B** G. Burke
8. Resource Contention Analysis & Recommendations **B** W. Hincy
9. Contention Resolution **B** G. Burke
10. Action Item Summary **B** G. Burke

***Introduction*** B ***G. Squibb*, RARB Chair**

The Space Ops Council, composed of the Associate Administrators of Codes M, S and Y, endorsed the funding of six implementations to help alleviate the forecasted over-subscription of the DSN in 2003 and 2004. The six implementations were:

- Delta DOR (Navigation)
- Install 20 kW X-Band Transmitters On Five 34-Meter Beam Waveguide (BWG) Antennas
- Acceleration of Network Simplification Program (NSP)
- Build an Additional 34-Meter BWG Antenna in Madrid
- Capability to Array Antennas at Madrid and Canberra
- Automation for 2-Channel Multiple Spacecraft Per Antenna (MSPA)

The Request for Proposal (RFP) for an additional 34-meter BWG antenna in Madrid (DSS 55) will be out in February. As a consequence for these new implementations, the Ka-band implementation will be partially delayed. The 34-meter BWG subnet will be implemented by 2005 with receive-only Ka-Band. An oversight committee headed by R. Spearing and E. Huckins at Headquarters, and E. Burns of SOMO, will track the progress of these implementations.

The Deep Space Network requested funding for a number of implementations, which were denied. These were: build two additional 34-meter BWG antennas, one in Madrid and one in Canberra; four-channel MSPA; augmentation of DSS 27. A quantitative risk assessment was performed to evaluate the risk of denial of service over the four-month period from November 2003 through February 2004. Of the 32 critical events planned during this period, with an assumed 3 passes per event, a 1%-2% risk of denial of service was

determined, which would result in about 12 hours not covered. In addition, it was forecast to have up to 8 spacecraft emergencies in this period that would necessitate additional coverage. This has prompted Code S to establish a process to recover from ground-based failures and spacecraft emergencies in this period of high activity. This will be set up by mid-2002, with the task beginning soon.

A planned date for a delta RARB was proposed for April 27, 2001, to address the contention period from November 2003 through December 2004. Concurrence from those in attendance was noted. ***(NOTE: Prior to the publication of these minutes, it was decided that the proposed delta RARB would not be held. The next RARB is planned for August 14, 2001, and will address 2003-2004 in detail.)***

***Overview: E. Burke***

After welcoming the participants, TMOD organizational changes were reviewed (see organization chart). The Agenda was reviewed and the Review Board introduced.

Even with the previously discussed implementations, the forecasted over-subscription in the 2003-2004 timeframe will still produce problems. It will not completely alleviate peak demands for antenna usage. There will be dissatisfied customers. We will utilize a layered approach for users that will first satisfy minimum coverage needs, then navigation needs, on through full science desires. This will help ascertain where cuts need to be made.

***JPL DSMS Engineering Status: K. Kimball (for J. Statman)***

The latest engineering and implementation activities were discussed.

- The newly approved funding for a 34-meter BWG antenna in Madrid (DSS 55) will be implemented with X-Band uplink/downlink, 20 kW transmitter and Ka-Band downlink. DSS 55 will be available November 1, 2003.
- The 34-meter Ka-band downlink task is currently replanning due to SOMO budget changes; details will be forthcoming.
- The 70-meter X-Band uplink task has one more antenna to implement. DSS 63 in Madrid is scheduled to be down 12 weeks beginning July 30 and returning to service October 7. Both DSS 14 and DSS 43 have operational 20 kW X-Band transmitters.
- The Telecom Link Design Handbook, 810-005, Rev. E, has been revised and is now released.
- The Madrid Complex (MDSCC) is preparing a feasibility report addressing whether to repair or relocate DSS 65 due to problems with its foundation. The earliest repair date is in FY 2003 under current funding plans. Satisfactory operations are achieved with restricted slew rates.
- The 70m Equivalency Study has rejected three of seven options. The options remaining are either to replace with an array, replace with a new single aperture structure, perform major rehabilitation to existing antennas, or to continue maintenance and sustaining.
- The Network Control Task Delivery 1.3 has been deferred to this summer. Replan is in process.
- The next speaker will address the 26-meter Automation Task and Network Simplification Project (NSP).

***Briefing on 26-meter Automation Task and Network Simplification Project (NSP): S. Kurtik***

The 26-meter Automation Task is on target for a July delivery, fixing deficiencies in numerous areas. The plan is to have a three-phase delivery. Contract negotiation is nearly in place. Again, it was stressed how important it is to have valid Sequence of Events (SOE) from the projects to achieve the goal of automation.

The Network Simplification Project (NSP) consists of three subtasks, which replace Telemetry, Command and Radiometric data systems. An important point is that current interfaces will be maintained; some will be augmented, such as adding the CCSDS Space Link Extension (SLE) to the command subsystem. The exception is with TRK-2-15A. An Action Item (AI#1) was assigned to S. Kurtik to investigate whether any changes to the GSFC-JPL ICD are needed and to specifically verify that the Flight Dynamics Facility (FDF) at GSFC is aware, or is not affected by this change.

***Mars Exploration Rover Mission Overview – P. Theisinger***

The schedule for this two-rover mission is very important. Currently, there are only 28 months to Launch. Launch periods are 18 days for each rover and begin May 30, 2003 for MER-A and June 27, 2003 for MER-B. Entry, Descent and Landing (EDL) have fixed dates of January 4, 2004 for MER-A and February 8, 2003 for MER-B. Nominal Rover operations, while on the surface, are expected to last at least 90 sols. If the atmosphere has high dust content, then 60 sols are expected.

Mission Events have been adjusted to minimize both internal Project contention, and external contention with other mission activities known at this time. Currently, DSN support is primarily requested on 34-meter antennas from Launch through EDL. Some use of 70-meter antennas is requested to support Mars Approach and EDL preparation. Delta DOR measurements will be used to ensure accurate Navigation and will need two antennas, concurrently from separate complexes. Surface operations require 70-meter antennas to receive telemetry directly from the rovers. Landing sites will not be selected until June 2002 and it is recognized that this will affect planning the detailed DSN allocations during surface operations.

***Resource Contention Summary – G. Burke***

Projected Lost Time and Yearly Supportable Time Summaries were given for the period 2002-2011 for the 26/34/70M systems. In addition, subnet contention for 2002 and 2003 was presented.

***Resource Contention – W. Hincy***

This main portion of the Review began with presentations of Loading Study Initial Conditions and Changes in Project Requirements. Background/source information was also shown. (View the web-based *"Red Book"* by clicking on the "link.") The following portion of the minutes describes in detail the results of RARB negotiations, and will be used as the new baseline for DSN resource allocation.

***Contention Resolution*** *B* ***G. Burke***

(To view in its entirety, click the “linked” title above.)

***Action Item Summary:*** ***Gene Burke***

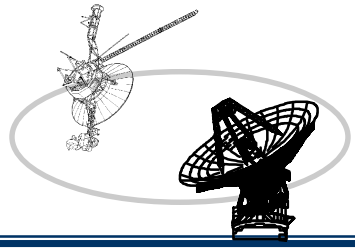
**Action Item #1:** Assigned to S. Kurtik

Network Simplification Project (NSP) will be eliminating the TRK-2-15A interface. Action is to investigate whether any changes to the GSFC-JPL ICD are needed, and to specifically verify that the Flight Dynamics Facility (FDF) at GSFC is aware and is not affected by this change.

*Due by April 27, 2001.*

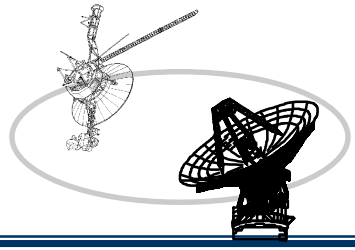
***The next meeting of the Resource Allocation Review Board will be held August 14, 2001. We will address 2003-2004 in detail.***

# RESOURCE ALLOCATION REVIEW
## 13 February 2001



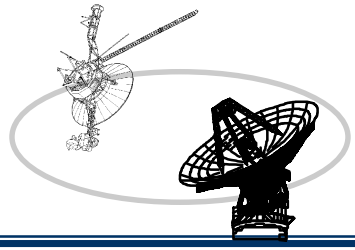
# AGENDA

| | | | |
|---|---|---|---|
| • | INTRODUCTION | G. Squibb | 8:30 |
| • | OVERVIEW | G. Burke | 8:45 |
| • | JPL DSMS IMPLEMENTATION PLANS | J. Statman | 9:00 |
| | – DSN Implementation Status | | |
| | – 26m Automation Task / Network Simplification Project | S. Kurtik | 9:20 |
| • | NEW OR CHANGED REQUIREMENTS | | |
| | – Mars Exploration Rover | P. Theisinger | 9:40 |
| • | RESOURCE CONTENTION | | |
| | – Summary | G. Burke | 10:10 |
| | – Analysis & Recommendations | W. Hincy | 10:20 |
| | – Responses | Projects | |
| | – Discussion / Decisions | All | |
| • | ACTION ITEMS & SUMMARY | G. Burke | |



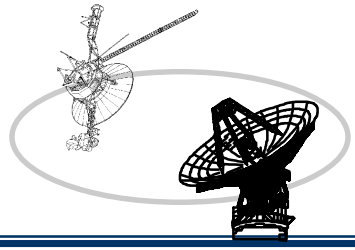
# REVIEW BOARD MEMBERS

| | | |
|---|---|---|
| Gael Squibb | JPL | Chairman |
| Gene Burke | JPL | DSMS Resource Allocation Planning & Scheduling Office Mgr |
| Arden Albee | Caltech | Mars Global Surveyor Project Scientist |
| **Donald Burnett** | Caltech | Genesis Project Scientist |
| Elizabeth Citrin | GSFC | MAP Project Manager |
| **Joy Crisp** | JPL | Mars Exploration Rover (MER) Project Scientist |
| Alan Cummings | Caltech | Voyager Project Scientist Representative |
| Peter Doms | JPL | Deep Space Mission System (DSMS) Manager |
| **Tom Duxbury** | JPL | Stardust Project Manager |
| Mike Ebersole | JPL | SIRTF Project Manager Representative |
| Bob Farquhar | APL | MESSENGER Mission Manager, CONTOUR |
| John Gagosian | GSFC | TDRS I, J Project Manager Representative |
| **David Gallagher** | JPL | SIRTF Project Manager |
| Ike Gillam | HTSI | CSOC JPL Site Manager |
| Dick Goldstein | JPL | Goldstone Orbital Debris Radar |
| **Richard Horttor** | JPL | Mars Express Orbiter (MEO) Project |
| Torrence Johnson | JPL | Galileo Project Scientist |
| Ross Jones | JPL | MUSES-C Project Manager |



# REVIEW BOARD (Cont'd)

| | | |
|---|---|---|
| Mike Klein | JPL | Radio Astronomy Project Manager |
| **Paolo Maldari** | ESA | INTEGRAL Ground Segment Manager |
| Ed Massey | JPL | Ulysses/Voyager Project Manager |
| Dennis Matson | JPL | Cassini Program Scientist |
| Rich Miller | JPL | DSMS Plans & Commitments Office Manager |
| Bob Mitchell | JPL | Cassini Project Manager |
| **Ted Mueller** | APL | STEREO Project Manager |
| **Brian Muirhead** | JPL | Deep Impact Project Manager |
| Bob Nelson | JPL | DS1 Project Scientist |
| Steve Ostro | JPL | GSSR Project Scientist |
| George Pace | JPL | Mars 2001 Odyssey Mission Project Manager |
| Bob Preston | JPL | U.S. Space VLBI Project Scientist |
| Mark Rayman | JPL | DS1 Project Manager |
| Chet Sasaki | JPL | Genesis Project Manager |
| Steve Saunders | JPL | Mars 2001 Odyssey Mission Project Scientist |
| **Rudi Schmidt** | ESA | Mars Express Orbiter (MEO) Project |



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| | | |
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| Rance Skidmore | Omitron | GOES Project Manager Representative |
| Marty Slade | JPL | GSSR Project Manager |
| Ed Smith | JPL | Ulysses Project Scientist |
| Joel Smith | JPL | U.S. Space VLBI Project Manager |
| Joe Statman | JPL | DSMS Engineering Program Office Manager |
| **Eileen Theilig** | JPL | Galileo Project Manager |
| Pete Theisinger | JPL | Mars Exploration Rover (MER) Project Manager |
| **Tom Thorpe** | JPL | Mars Global Surveyor Project Manager |
| Phil Varghese | JPL | TMOD Mission Management Office (MMO) |
| **Joe Wackley** | JPL | DSMS Operations Office Program Manager |
| **Manfred Warhaut** | ESA | Rosetta Ground Segment Manager |
| Bill Worrall | GSFC | Orbiting Satellites Manager (ISTP, ACE, INTEGRAL) |
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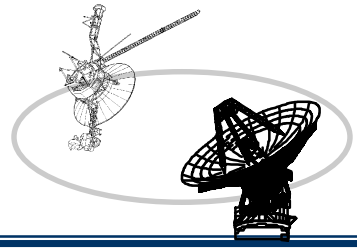
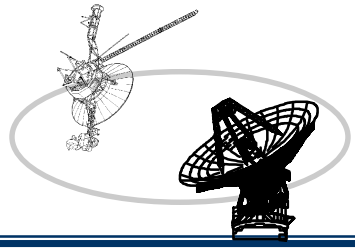


# INTRODUCTION

JPL

*Gael Squibb*



# INTRODUCTION

- WELCOME TO THE RESOURCE ALLOCATION REVIEW
  - BOARD WAS ESTABLISHED TO PROVIDE CONTROL OF TRACKING REQUESTS – 26, 34, & 70 METER SUBNETS
  - RECOMMEND RESOURCE ALLOCATION AND ASSIST IN CAPACITY PLANNING
- REQUIREMENTS 2002 THROUGH 2011
- CONFLICTS IN 2002 AND 2003 NEED RESOLUTION


# DSN '03 - '04 Overload Final Report
# February 9, 2001

# Base DSN Implementation Summary

| AREA | FY01 | FY02 | FY03 | FY04 | TOTAL |
|---|---|---|---|---|---|
| DELTA DOR (NAVIGATION) | 1.9 | 0.8 | 0.9 | 0.4 | 4.0 |
| 20 KW TX ON 5 BWG ANTENNAS | 2.5 | 4.4 | 1.8 | 0.3 | 9.0 |
| ACCELERATE NSP | 0.5 | 1.4 | 0.9 | | 2.8 |
| ADDITIONAL BWG @ MADRID | 10.0 | 13.0 | 10.0 | | 33.0 |
| ARRAYING @ MADRID & CANBERRA | 1.0 | 2.0 | 1.0 | | 4.0 |
| MSPA AUTOMATION | 0.2 | 0.7 | 0.0 | | 0.9 |
| TOTAL | 16.1 | 22.3 | 14.6 | 0.7 | 53.7 |

# Recommendation

- Approve the construction of a 34M antenna at Madrid and other long-lead items identified in the base DSN Upgrades list
  - Determine which, if any, risk reduction options will be exercised
  - Delay Ka-Band implementation on the DSN and apply available funds to the required upgrades for the Overload period
    - $3.5M in FY01, $3.8M in FY02, $7.7M in FY03
- Formalize the remaining funding sources required for these upgrades and proceed immediately to convert $5M FY01 funds to C of F to support the new antenna construction at Madrid

TELECOMMUNICATIONS AND MISSION OPERATIONS DIRECTORATE

# ORGANIZATION CHART

JPL

Effective: December 11, 2000

**900**
**TELECOMMUNICATIONS AND MISSION OPERATIONS DIRECTORATE**
G.F. Squibb, Director
R.C. Coffin, Deputy Director
P.E. Doms, DSMS Program Manager

**900**
A.Z. Dowen, SOMO Systems Engineering Advisor
A.J. Hooke, SOMO Standards Program Mgr.
Vacancy, TMOD Chief Engineer
R.G. Polansky, Assistant Chief Engineer & ISO Rep.
K.A. Blom, Align & Integrate Domain Process Engineer
J.H. Yuen, TMO Progress Reports Editor
Directorate Technical Staff:
M.J. Rodrigues
Directorate Secretarial Staff:
L.G. Deady
J.N. Pulliam

**910 - BUSINESS OPERATIONS OFFICE**
T.R. Scheck, Mgr.

**905 - TMOD SYSTEMS ENGINEERING AND STANDARDS OFFICE**
W.S. Tai, Mgr.

**901 - MARS NETWORK PROJECT OFFICE**
C.D. Edwards, Mgr.

**902 - MISSION MANAGEMENT OFFICE**
P. Varghese, Mgr.
S.N. Rosell, DM

**903 - MISSION DATA SYSTEM OFFICE**
A. Sacks, Mgr.

**920 - DSMS PLANS AND COMMITMENTS PROGRAM OFFICE**
R.B. Miller, Mgr.
D.G. Griffith, DM

**930 - DSMS OPERATIONS PROGRAM OFFICE**
J.A. Wackley, Mgr.
Vacancy, DM

**940 - DSMS ENGINEERING PROGRAM OFFICE**
J.I. Statman, Mgr.
J.C. Klose, DM

**970 - TMOD TECHNOLOGY PROGRAM OFFICE**
J.R. Lesh, Mgr.

**907 - MARS GLOBAL SURVEYOR PROJECT OFFICE**
T.E. Thorpe, Mgr.

**908 - STARDUST PROJECT OFFICE**
T.C. Duxbury, Mgr.

**909 - DEEP SPACE 1 PROJECT OFFICE**
M.D. Rayman, Mgr.

**950 - GALILEO PROJECT OFFICE**
E.E. Theilig, Mgr.

**960 - U.S. SPACE VLBI PROJECT OFFICE**
J.G. Smith, Mgr.

**980 - VOYAGER / ULYSSES PROJECT OFFICE**
E.B. Massey, Mgr.

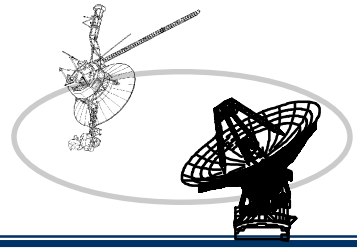
**990 - CASSINI PROGRAM OFFICE**
R.T. Mitchell, Mgr.
J.M. Gunn, Asst. Pgrm. Mgr. For Development (36)

Legend:
DSMS = Deep Space Mission System
SOMO = Space Operations Management Office
DSN = Deep Space Network
CSOC = Consolidated Space Operations Contract
VLBI = Very Long Baseline Interferometry
DM = Deputy Manager
AD = Additional Duty

*Original Signed*

G.F. Squibb, Director for
Telecommunications and Mission Operations

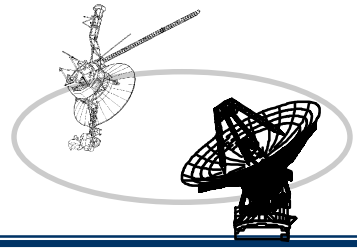
00-257A
December 11, 2000



# OVERVIEW

JPL

*Gene Burke*

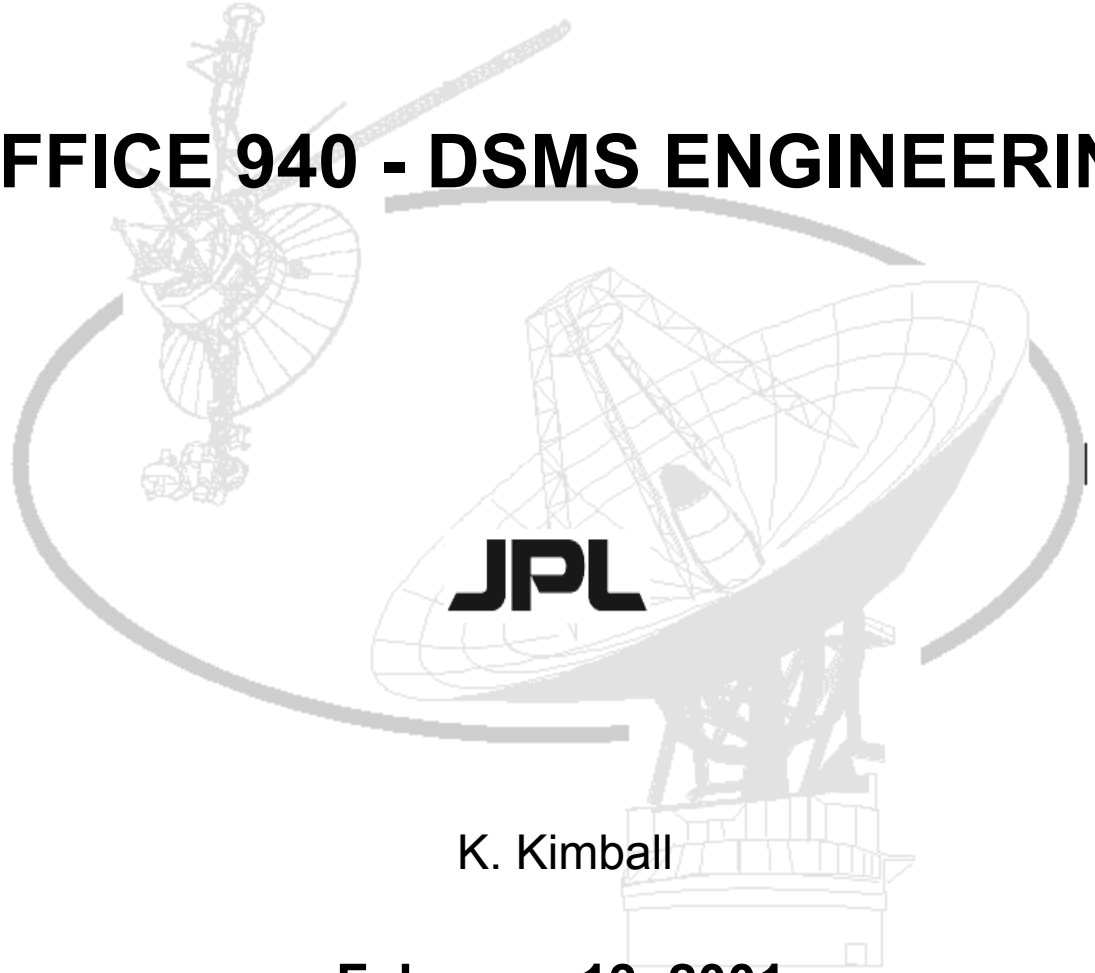


# CONTENTION RESOLUTION PROCESS

- CONTENTION EXPLANATION
- RESOURCE ANALYSIS TEAM (RAT) RECOMMENDATIONS
- PROJECT RESPONSE TO RECOMMENDATIONS
- REVIEW BOARD DISCUSSIONS
- REVIEW BOARD DECISIONS

# RARB Meeting

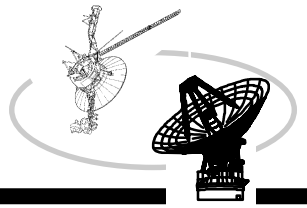
# OFFICE 940 - DSMS ENGINEERING




K. Kimball

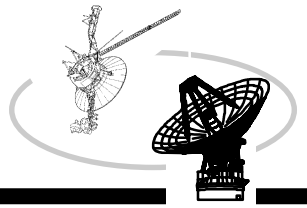
**February 13, 2001**

# Office 940 - DSMS Engineering



- **WHAT'S NEW**
  - **NEW BWG ANTENNA, DSS-55**
  - **34m Ka-BAND DOWNLINK TASK**
  - **70m X-BAND UPLINK TASK**
  - **OTHER ITEMS OF INTEREST**
  - **26m AUTOMATION (presented by S. Kurtik)**
  - **NETWORK SIMPLIFICATION PROJECT (presented by S. Kurtik)**
- **DOWNTIME SUMMARY**
  - **NEAR-TERM (through 8-1-01)**
  - **LONG-TERM (start after 8-1-01)**

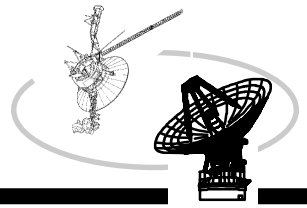
# WHAT'S NEW?



## NEW BWG ANTENNA, DSS-55

- **OVERVIEW**
  - **A new Beam Waveguide Antenna has been funded, driven by increased mission support needs beginning in 2003**
  - **Will be configured with X-Band uplink/downlink, 20kW transmitter, Ka-Band downlink**
  - **Located at Madrid DSCC**
- **UPCOMING EVENTS**
  - **Issue RFP for Antenna Construction on Feb 16**
  - **Award contract on June 1**
- **AVAILABILITY**
  - **November 1, 2003 with X-Band Uplink/Downlink**

# WHAT'S NEW?

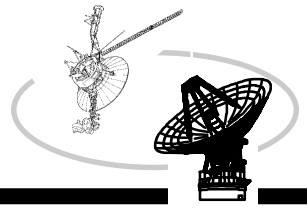


## 34m Ka-Band Downlink Task

- **STATUS UPDATE (since Feb 99)**
  - **Replan of task underway due to SOMO budget changes**
  - **CDR planned for Dec 00 not held**
- **UPCOMING EVENTS**
  - **Critical Design Review (date TBD pending replan)**
- **OPERATIONAL DATES (old baseline)**
  - **DSS-26: Sept 2002 DSS-54: Jan 2003 DSS-34: Dec 2003**

    **DSS-24: May 2004 DSS-25: Sept 2004**
- **PROJECT IMPACT**
  - **No interface changes planned. 810-005 module 104 (old TCI-31) has been updated to describe performance**

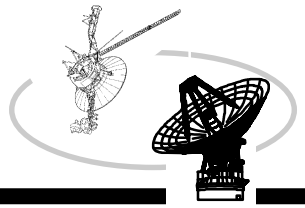
# WHAT'S NEW?



## 70m X-Band Uplink Task

- **STATUS UPDATE (since Feb 00)**
  - **Modifications completed at DSS-43.**
  - **DSS-14 and DSS-43 now operational**
- **UPCOMING EVENTS**
  - **12-week downtime at DSS-63 (begins July 30)**
- **OPERATIONAL DATES**
  - **Oct 7 2001 for DSS-63**
- **PROJECT IMPACT**
  - **No interface changes. Update to 810-005 module 101 (old TCI-10) after performance measurements complete (FY01)**

# WHAT'S NEW?



## OTHER ITEMS OF INTEREST

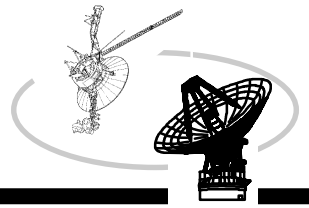
- **810-005 Rev E: Released and available to external users at**

  **http://deepspace.jpl.nasa.gov/dsndocs/810-005/**

- **DSS-65 FOUNDATION**
  - **MDSCC preparing feasibility reports relative to repair or antenna relocation.**
  - **Earliest date to begin repair or relocation is FY03. Continue to operate satisfactorily with restricted slew rate.**
- **70M STUDY**
  - **Effort slowed by DSS-55 work. Three of seven options rejected. Four remaining are:**
    - **Replace with array**
    - **Replace with new single-aperture structures**
    - **Major rehabilitation to existing antennas**
    - **Continue maintenance and sustaining**
- **NETWORK CONTROL TASK**
  - **Delivery 1.3 (remove DCE/DFS) deferred to summer 01. Replan in work**

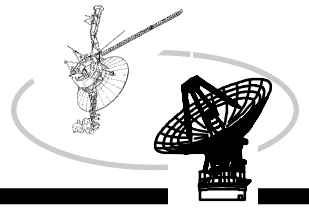
# Near-term Downtime Schedule

## (2-1-01 through 8-1-01)



- **70m X-Band Uplink Modifications (DSS-63)**
  - **July 23 - October 1 2001. Concurrent tasks: Azimuth cablewrap rehab, counterweight rebalance, hydrostatic bearing regrout**

# Summary of Long-term Downtime Needs and Schedule (after 8-1-01)



- **70m Servo Drive (10 weeks per antenna).**
  - DSS-14: July 15 -Sept 27 2002 DSS-43: Nov 25 - Feb 9 2003
  - DSS-63: Feb 10 - Apr 20 2003
- **26m Servo Drive Replacement (4 wks per antenna).**
  - DSS-16: Aug 20 - Sept 15 2001 DSS-46: May 5 - June 1 2003
  - DSS-66: Jun 24 - Jul 21 2002
- **HEF Antenna Controller Replacement (7 weeks per ant).**
  - DSS-15: Mar 3 - May 4 2003 DSS-45: Sep 8 - Oct 26 2003
  - DSS-65: TBD
- **DSS-63 Ball Joint Refurbishment (proposed July/August 03)**
- **Network Simplification Project**
  - DSS-14, 15: Aug 1 - Sept 27 2002
  - DSS-26: Oct 1 2002 - March 30 2003
  - DSS-24, 45, 54: Oct 1 - Nov 22 2002
  - DSS-43, 65: Dec 2 2002 - Feb 9 2003
  - DSS-25, 34, 63: Feb 10 - April 20 2003

TELECOMMUNICATIONS AND MISSION OPERATIONS DIRECTORATE

# JPL Deep Space Mission System (DSMS)

## Briefing to RARB on:

## 26 M Automation Task Status

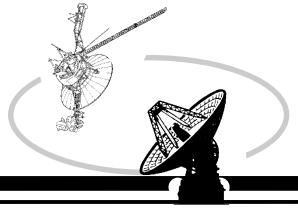
## Network Simplification Project (NSP) Status

**Susan Kurtik**
*Telecom Services Office 940*
*Central Telecom Operations Office 930*

**February 6, 2001**

JPL

# Telecom Services Upgrades



- **Major DSN Thrusts in 2001-2003**
  - **26 M Antenna Automation Task**
    - **Replace existing DSN TLM, CMD, M&C Systems with automated standalone system for 26 M (replace TCA/CPA/LMC)**
    - **Replace 20 kW transmitter with new 2 kW transmitter**
  - **Deep Space Network Simplification Project (NSP) for 34, 70 M subnet**
    - **New Command Replacement (replace CMA/CPA)**
    - **New Telemetry Replacement (replace TGC/TCA)**
    - **New Ranging/Doppler Redesign (replace SRA/MDA)**
    - **New JPL Radiometric Data Conditioning System (replace RMDC)**
      - Decommit TRK-15A Format (New TRK-2-34, TRK-2-18, TRK-2-20)
  - **New CCSDS Space Link Extension (SLE) Services**
    - **SLE Command Interface CMD-4-10 replaces CMD-4-6, CMD-4-9**
  - **New DSN Monitor Data Interface for Missions**
    - **0158-Mon monitor data replaces Mon-5-15**
  - **New Deep Space Turbo Decoder Implementation**
  - **BVR Enhancements (including low threshold, beacon tone detection)**

# 26M Automation Task

**What is it?**

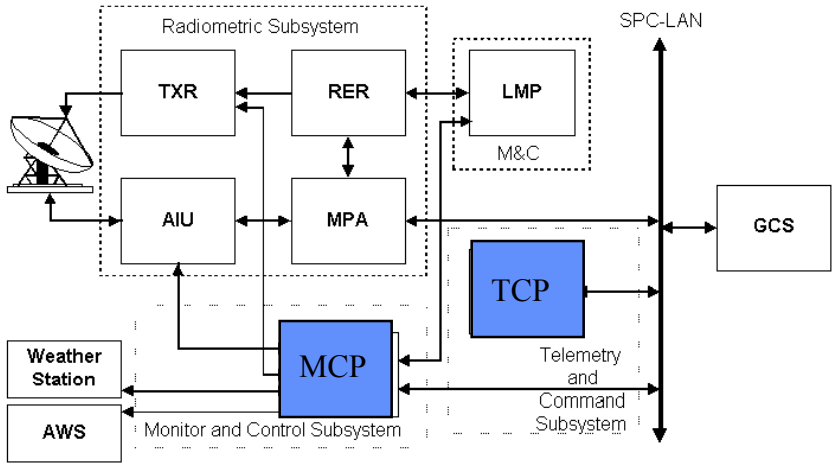
- Replacement of 26-meter telemetry and command data processing equipment
  - Telemetry and Command Processor (TCP), Monitor and Control Processor (MCP)
- Unique implementation for 26-meter TLM, CMD, and M&C equipment from 34-/70-meter network
  - 34, 70 m equipment being replaced under NSP/NMC project (TCA, CPA, LMC, CMC)
- Operations capability as automatic as possible within the funds available
  - Software driven by project nominal & override SOE files (26M Support Products Provider SPPA)

**Current status**

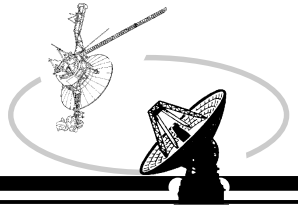
- Critical anomalies in July delivery, thus 26M replacement system pulled from 'soak' and connection restored to 34/70 M equipment
- Recovery Team found deficiencies in: Telemetry requirements, monitor and control functions, training, lack of hardware at DTF21 for efficient testing, incomplete documentation, TCP HTSIO hardware board not capable of time tag precision

**Recovery Plan Status:**

- 26M TCP/MCP in place at DTF21
- COTS Weather Station in place
- New 26M SPPA web interface under test
- Procure replacement TCP hardware board
- Additional Requirements documented
- Training for desktop generation, DSCC Ops
- Three Phase MCP/TCP Delivery Schedule




26-Meter Automation Architecture



JPL

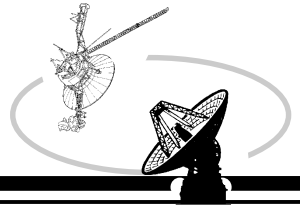
# 26M Delivery Schedule

- **26M MCP/TCP Delivery 1 February 2001**
  - **Enable 2KW transmitter operations**
  - **Safety notification for antenna**
  - **Limited mission set (TDRSS,GOES,RSAT,NOAA,SOLAR,ASTRO, TOMS,GEOTAIL)**
  - **Start GDSCC soak 2/21/01**

- **26M MCP/TCP Delivery 2 April 2001**
  - **Time tag corrections**
  - **Reed-Solomon Decoding**
  - **Replace TCP AT-HTSIO2 boards with Monarch boards**
  - **MCP Desktop Loading via SOE**
  - **Mission set (WIND, POLAR, SOHO, Chandra)**
  - **26M Support Products Provider (SPPA v 2.3) SOE Generation Interface**
    - **FOT Training at GSFC for SOE Generation (mid March) - also via web**
  - **Start GDSCC soak 4/16/01**

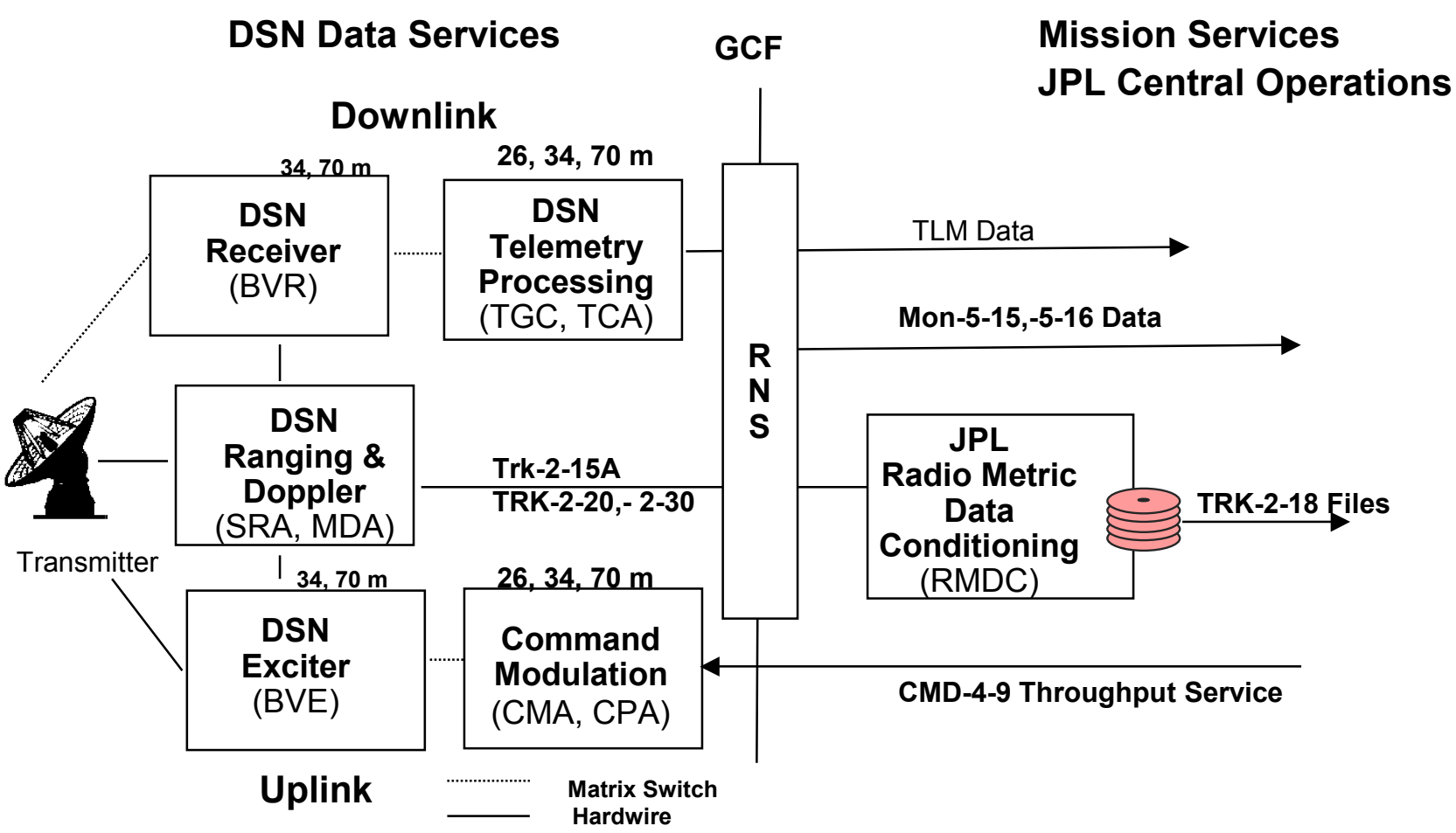
- **26M MCP/TCP Delivery 3 June-July 2001**
  - **TLM-3-29 multi-mission & TLM-3-27 SFDU**
  - **CCSDS CLTU Space Link Extension (SLE) Services (CMD-4-10)**
  - **Mission Set (IMAGE, MAP, TRIANA, SWAS, FUSE, STRV, ACE, Cluster)**
  - **Start GDSCC soak 6/27/01 *(may move to July due to GNS launch freeze)***

# Network Simplification Project (NSP)



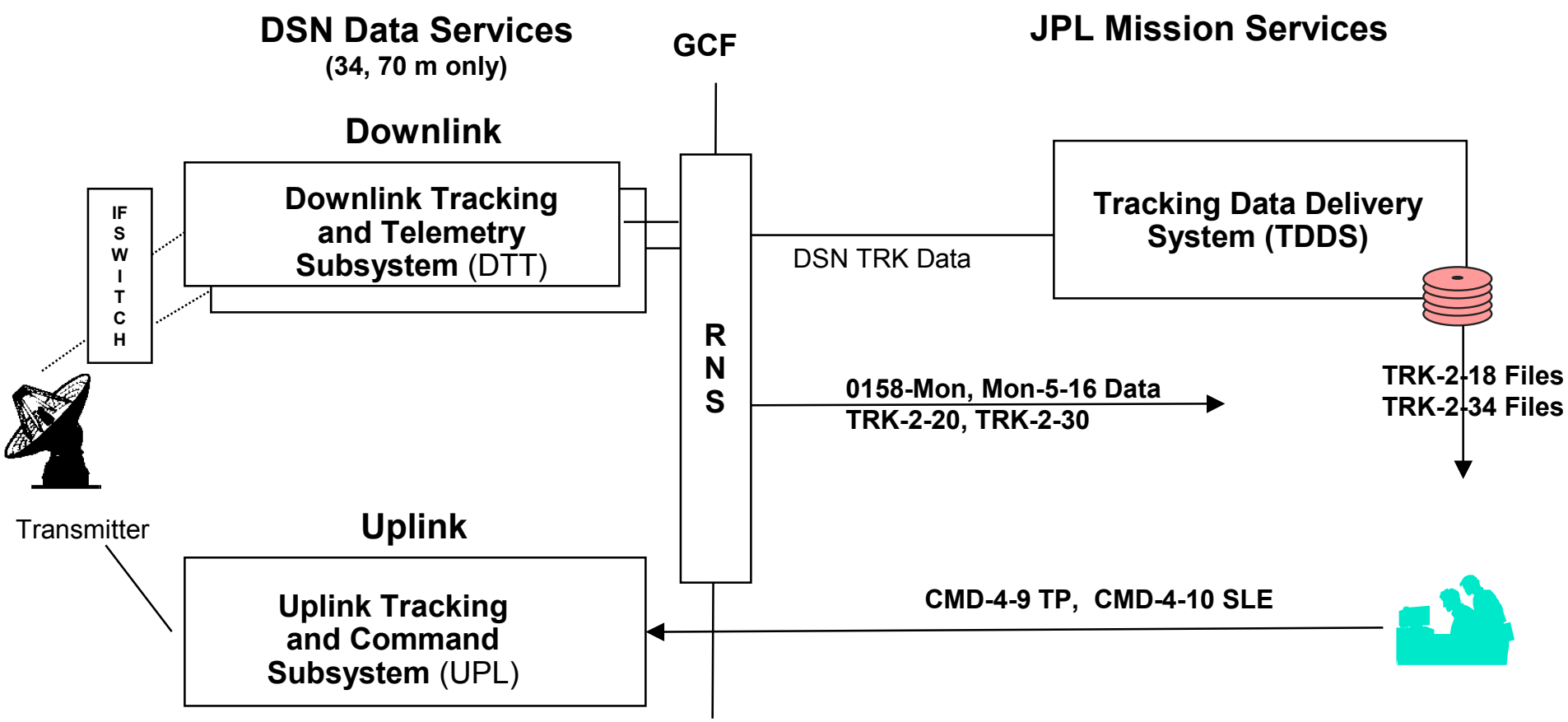
- **NSP consists of three tasks:**
  - **DSN Downlink Consolidation Task**
    - **Replaces DSN Telemetry Equipment (TGC/TCA)**
    - **Replaces DSN Ranging/Doppler Equipment (SRA, MDA)**
  - **DSN Uplink Consolidation Task**
    - **Replaces DSN Command Equipment (CMA/CPA/CMS)**
  - **JPL Tracking Data Delivery Subsystem (TDDS) Task**
    - **Replaces RMDC Data Conditioning**
    - **New tracking data product (TRK-2-34), decommit TRK-2-15A**

# Current DSMS TT&C Systems

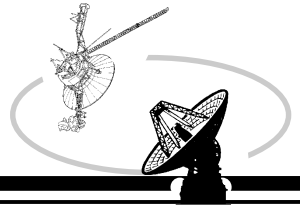


# DSMS TT&C Architecture in 2002-2003

## Simplified End-to-End Service Design



# NSP Accelerated Installation Schedule



**Accelerates installation of NSP by six months**

**Accelerates completion of Turbo decoders**

**KEY DATES – Installations at DSCC's** (DSS downtimes established)

| | DSS | DOWNTIME | ACTIVITY |
|---|---|---|---|
| • | **DSS-26** | **10/01/01 - 02/01/03** | **New BWG as NSP Testbed** |
| • | **DSS-15 & 14** | **07/15/02 - 09/27/02** | **NSP Implementation** |
| • | DSS-14 | 07/15/02 - 09/27/02 | 70M Servo Drive Upgrade |
| • | *DSS-26* | *8/1/02 - 10/1/02 (active)* | *Ops Support (may adjust)* |
| • | **DSS-24, 45, 54** | **10/1/02 - 11/22/02** | **NSP Implementation** |
| • | **DSS-43 & 65** | **12/02/02 - 02/09/03** | **NSP Implementation** |
| • | **DSS-25, 34, 63** | **2/10/03 - 4/06/03** | **NSP Implementation** |

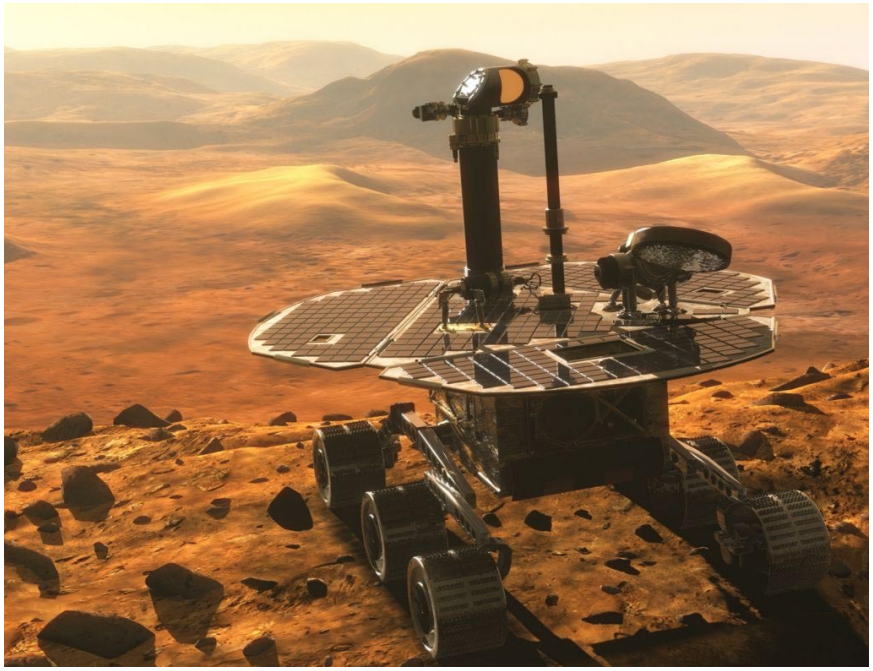
- **NSP DTT/UPL Delivery Schedule**
  - DTF-21 Integration 8/1/01 - 10/1/01
  - DSS-26 Testbed Demo 10/1/01 start
  - NSP TRR April 2002
  - NSP TTR August 2002
  - NSP Soak Start DSS26, DSS14 8/1/02 - 9/27/02

# *DSN Resource Allocation Review*

## *Mars Exploration Rover Mission Overview*

**Pete Theisinger**

**February 13, 2001**



## 12 Months to ATLO

**February 4, 2002**

## 28 Months to 1st Launch

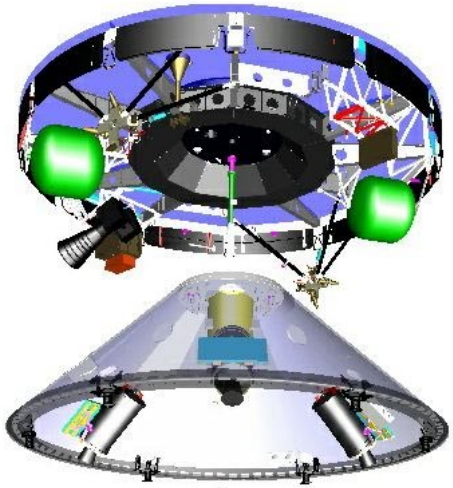
**May 30, 2003**

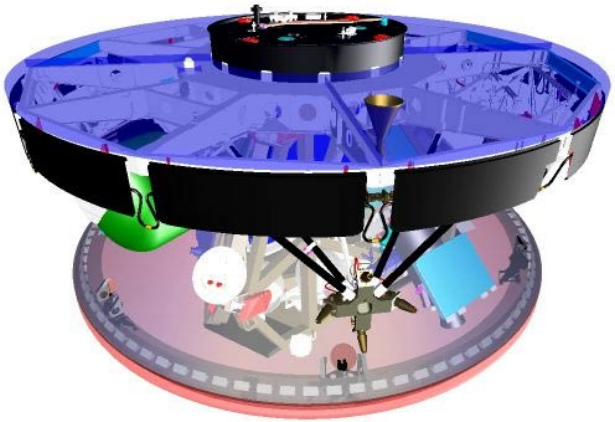
## 35 Months to 1st Landing

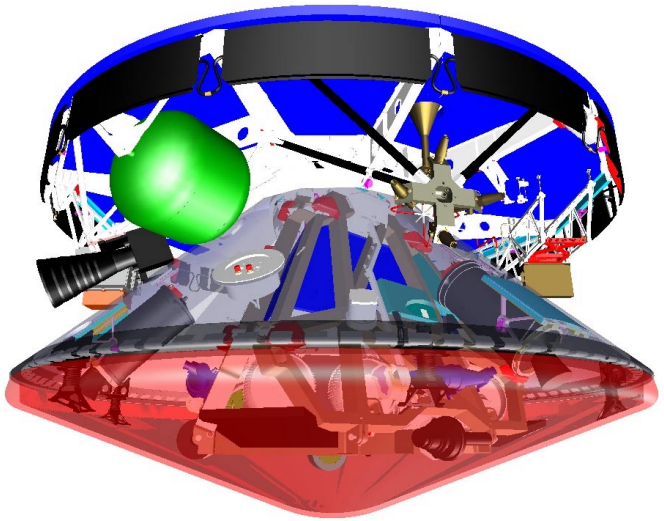
**January 4, 2004**

# Spacecraft Configuration - MPF Heritage



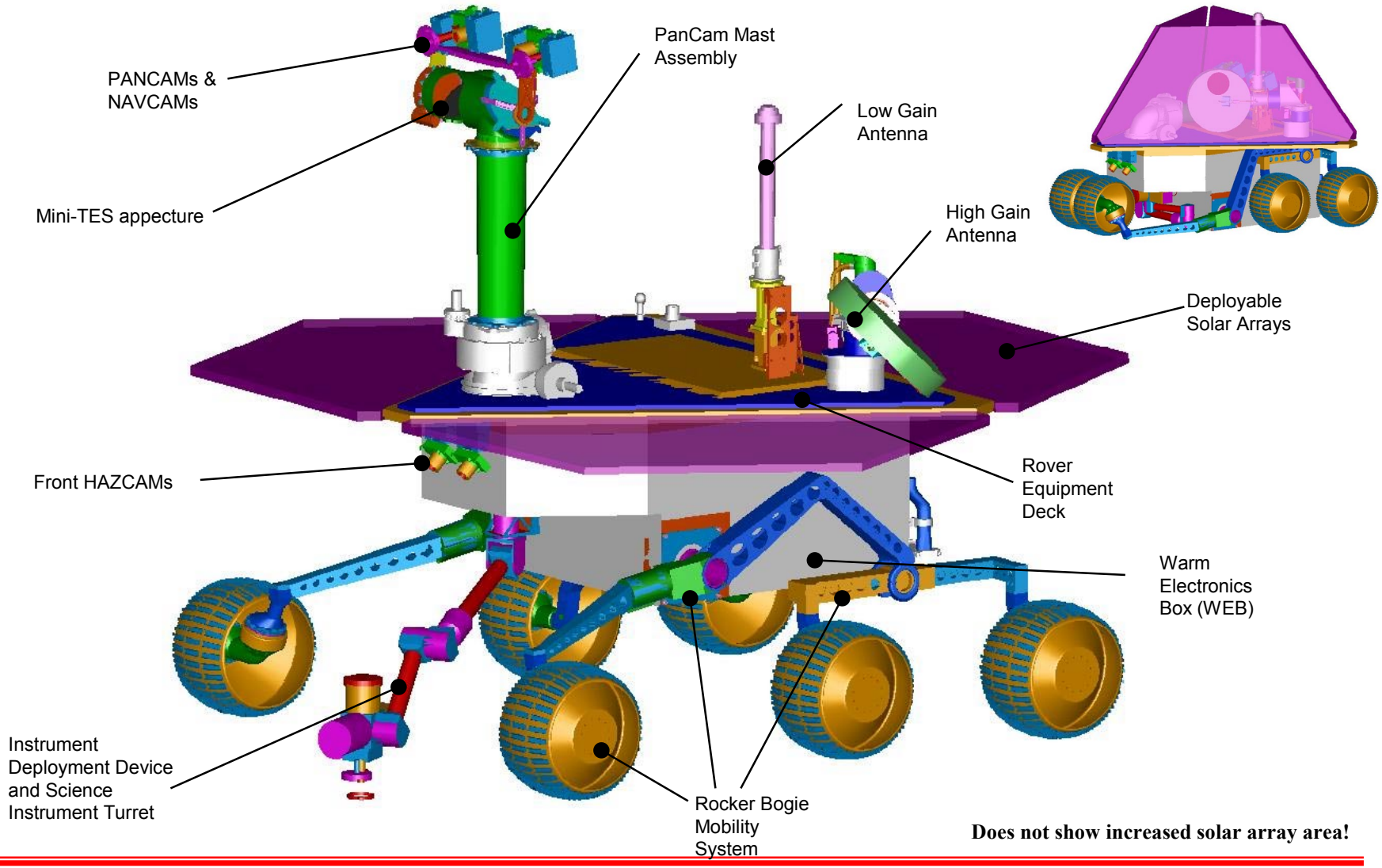






# Rover Configuration






**Does not show increased solar array area!**

# MER Science Goal and Objectives

## Science Goal:

- Determine the aqueous, climatic, and geologic history of a site on Mars where conditions may have been favorable to the preservation of evidence of pre-biotic or biotic processes.

## Objectives:

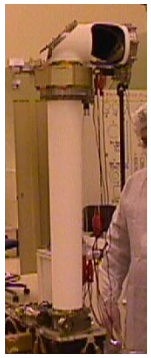
- Identify hydrologic, hydrothermal, and other processes that have operated at the site.
- Identify and investigate martian rocks and soils that have the highest possible chance of preserving evidence of ancient environmental conditions and possible pre-biotic or biotic activity.
- Respond to other discoveries associated with rover-based exploration.

# *MER's Athena Science Payload*



Panoramic multispectral images and IR spectra reveal the diversity of materials around the rover, and provide geologic context. These remote sensing data are used to select the most promising rock and soil targets for closer examination.

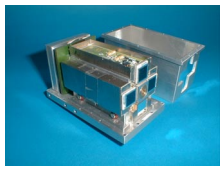
- **Remote Sensing Payload Elements:**
  - Panoramic imager (Pancam)
  - Panoramic mid-IR spectrometer (Mini-TES)



Pancam mast

The rover traverses to selected targets and investigates them in more detail (mineralogy, elemental chemistry, fine-scale texture) with the full instrument set. A rock abrasion tool can expose fresh rock surfaces.

- **In-Situ Payload Elements:**
  - Mössbauer Spectrometer
  - Alpha-Proton-X-Ray Spectrometer (APXS)
  - Microscopic Imager
  - Rock Abrasion Tool (RAT)



# Full and Minimum Mission Success



## Full Mission Success

Launch two identical rovers to Mars

Conduct surface operations for at least **90 sols** for each rover.

**Operate the Athena instrument suite** at each landing site during the 90 sols.

Acquire at least one full-color and at least one stereo 360° panoramic image of each landing site with the Pancam. Image one exposed rock that is also analyzed by another instrument.

Drive the rovers to a total of at least **8 separate locations** and use instrument suite to investigate context and diversity of environment.

Operate MER-A and MER B missions simultaneously on the surface of Mars for a period of at least 30 sols.

For at least one rover, **traverse a total distance of 600 meters**, with a goal of 1000 meters.

## Minimum Mission Success

Launch two identical rovers to Mars

Conduct surface operations for at least 90 sols for one rover (**60 sols for 0.5 < $\tau$ < 1.0**).

Operate the Athena **PanCam and at least one other Athena instrument** during the 90 sols.

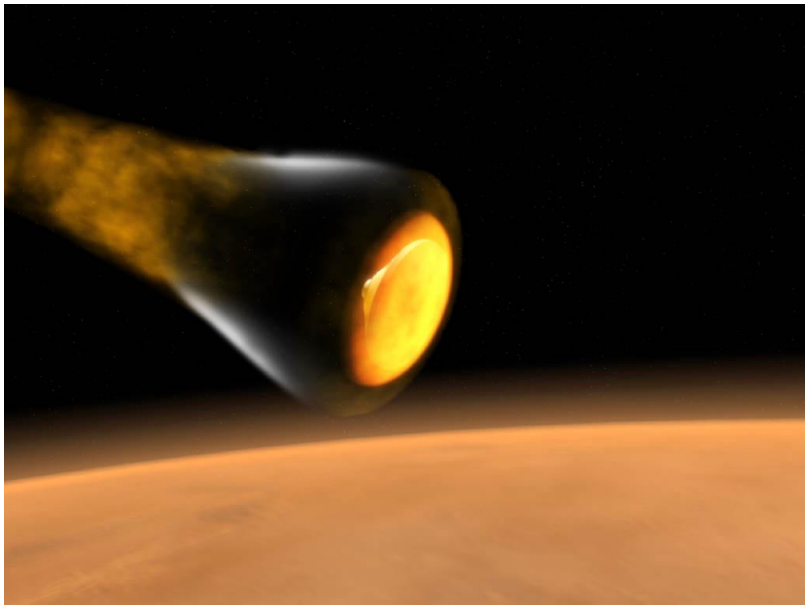
Acquire at least one full-color and at least one stereo 360° panoramic image of one landing site with the Pancam. Image one exposed rock that is also analyzed by another instrument.

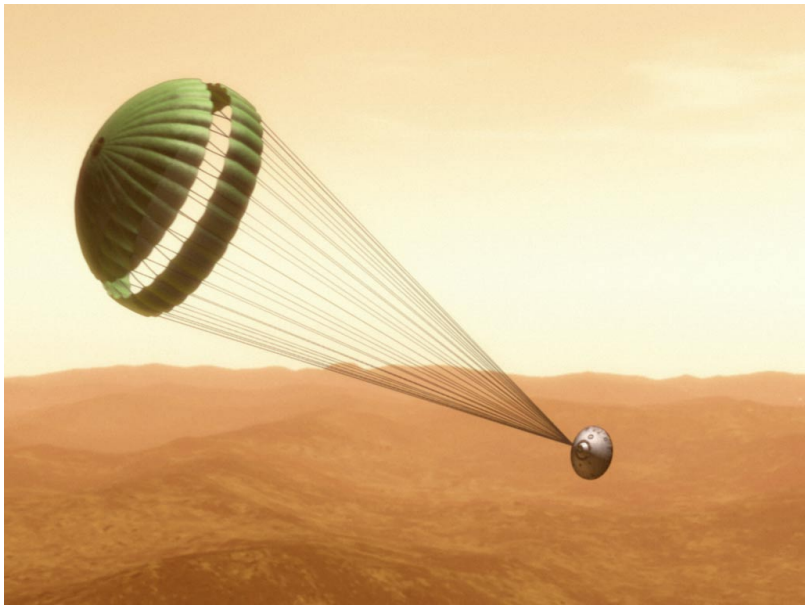
Drive the rovers to a total of at least **4 separate locations** and use instrument suite to investigate context and diversity of environment.

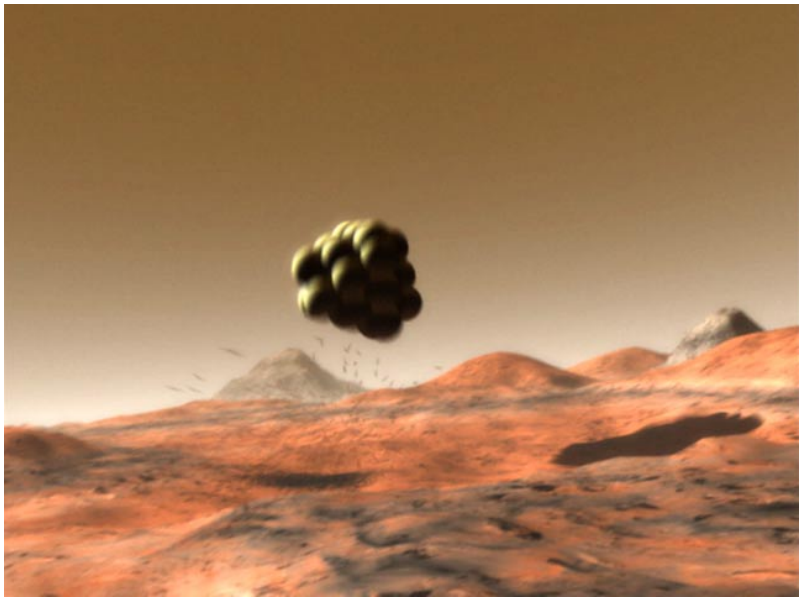
For at least one rover, **traverse a total distance of 300 meters**.

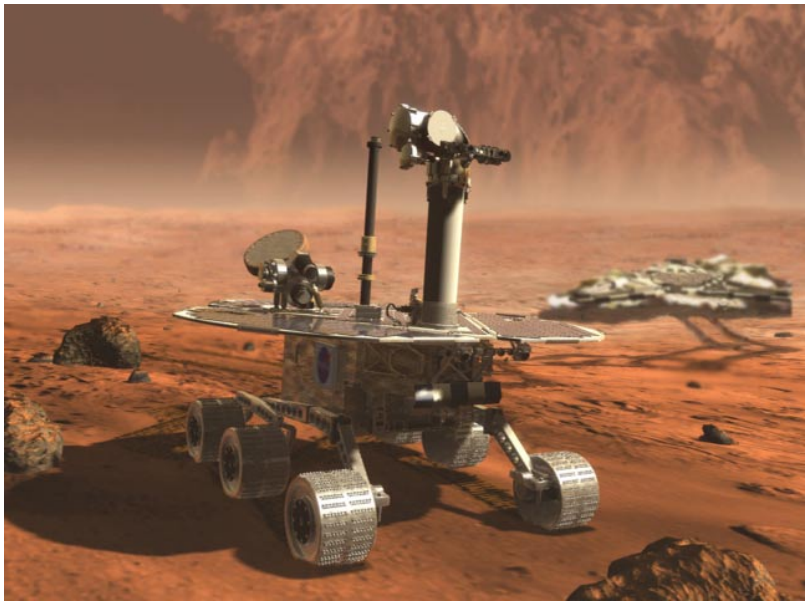
# *Entry, Descent & Landing (Artist Concept)*





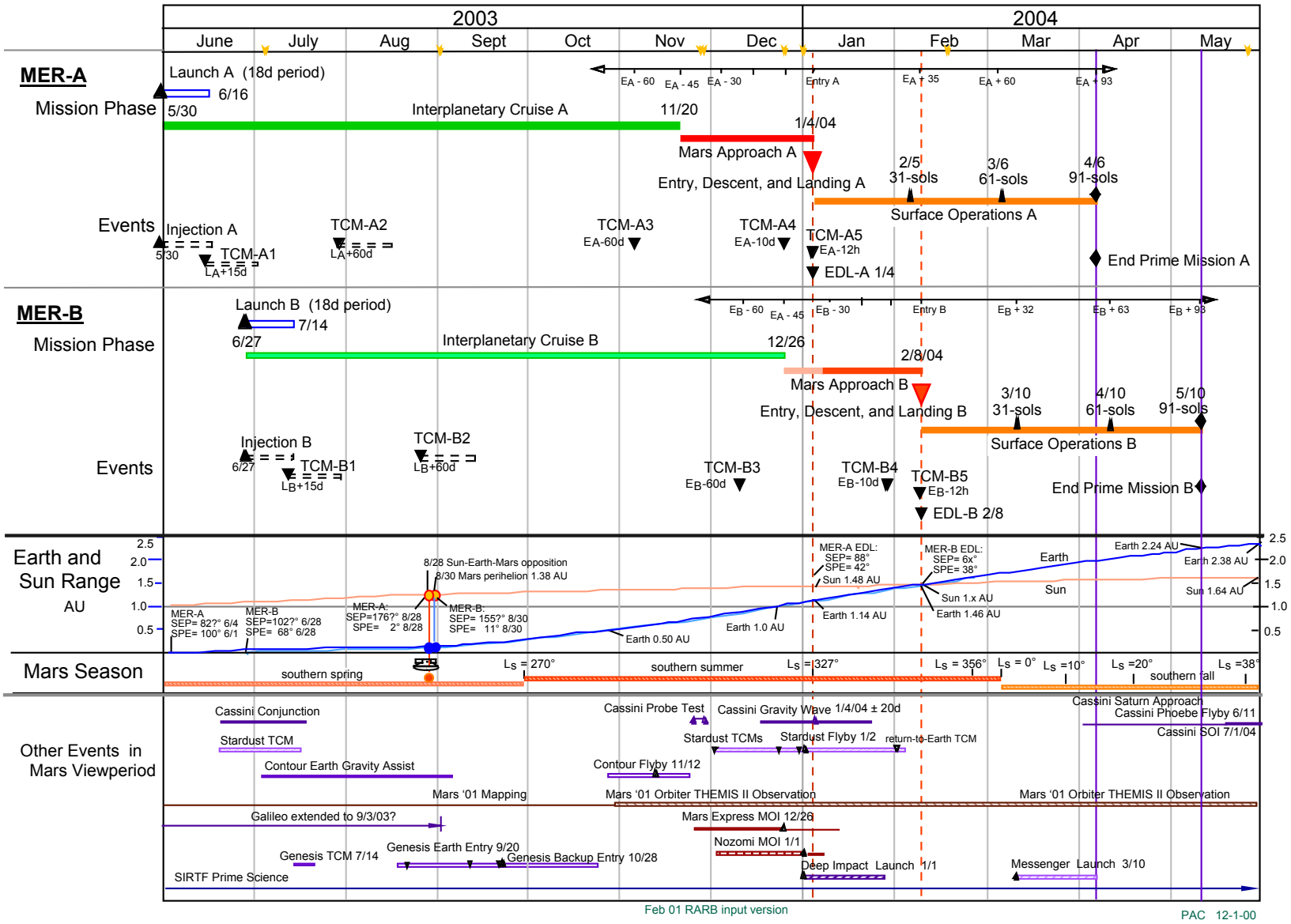






# Mission Timeline

Mars Exploration Rover

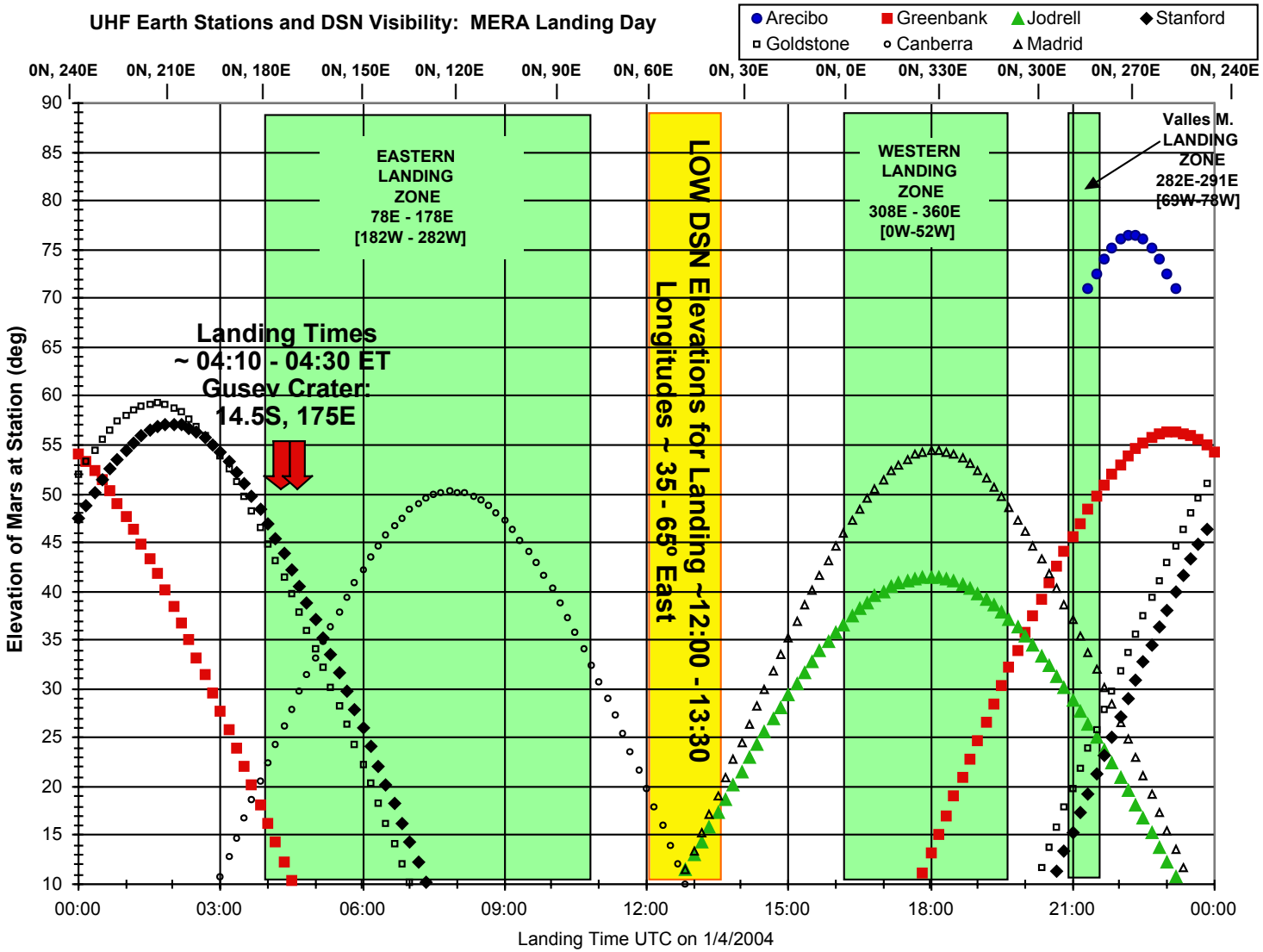


# Mission Design Overview

- **MER-A & MER-B: 18-day Launch Periods (Type I Transfer Trajectories)**
  - **MER-A**
    - Delta II 7925 launch vehicle
    - Launch period: May 30, 2003 through June 16, 2003 / Constant arrival date: January 4, 2004
  - **MER-B**
    - Delta II 7925H launch vehicle
    - Launch period: June 27, 2003 through July 14, 2003 / Constant arrival date: February 8, 2004
- **Interplanetary Cruise / Mars Approach**
  - **Total of 5 TCMs: L + 15d, L + 60d, E - 60d, E - 10d, E - 12h**
  - **Independent, complementary data types for robust approach navigation**
    - Doppler, Range, and ΔVLBI (ΔDOR/DDR) (ΔVLBI = delta Very Long Baseline Interferometry)
- **Entry, Descent, and Landing (EDL)**
  - **Real time Direct-to-Earth (DTE) communications from entry through bridle deployment. UHF coverage via MGS from bridle deployment through landing.**
- **Surface Mission**
  - **Landing site latitude range**
    - MER-A: 15° South to 5° North
    - MER-B: 10° South to 10° North
  - **Local time of landing**
    - MER-A: ~ 1:50 - 2:20 PM
    - MER-B: ~ 12:30 - 12:45 PM
  - **Surface operations lifetime of 91 sols**
  - **Functional redundancy in the telecom capability for surface operations**
    - X-band DTE and UHF via Mars 2001 Odyssey orbiter.

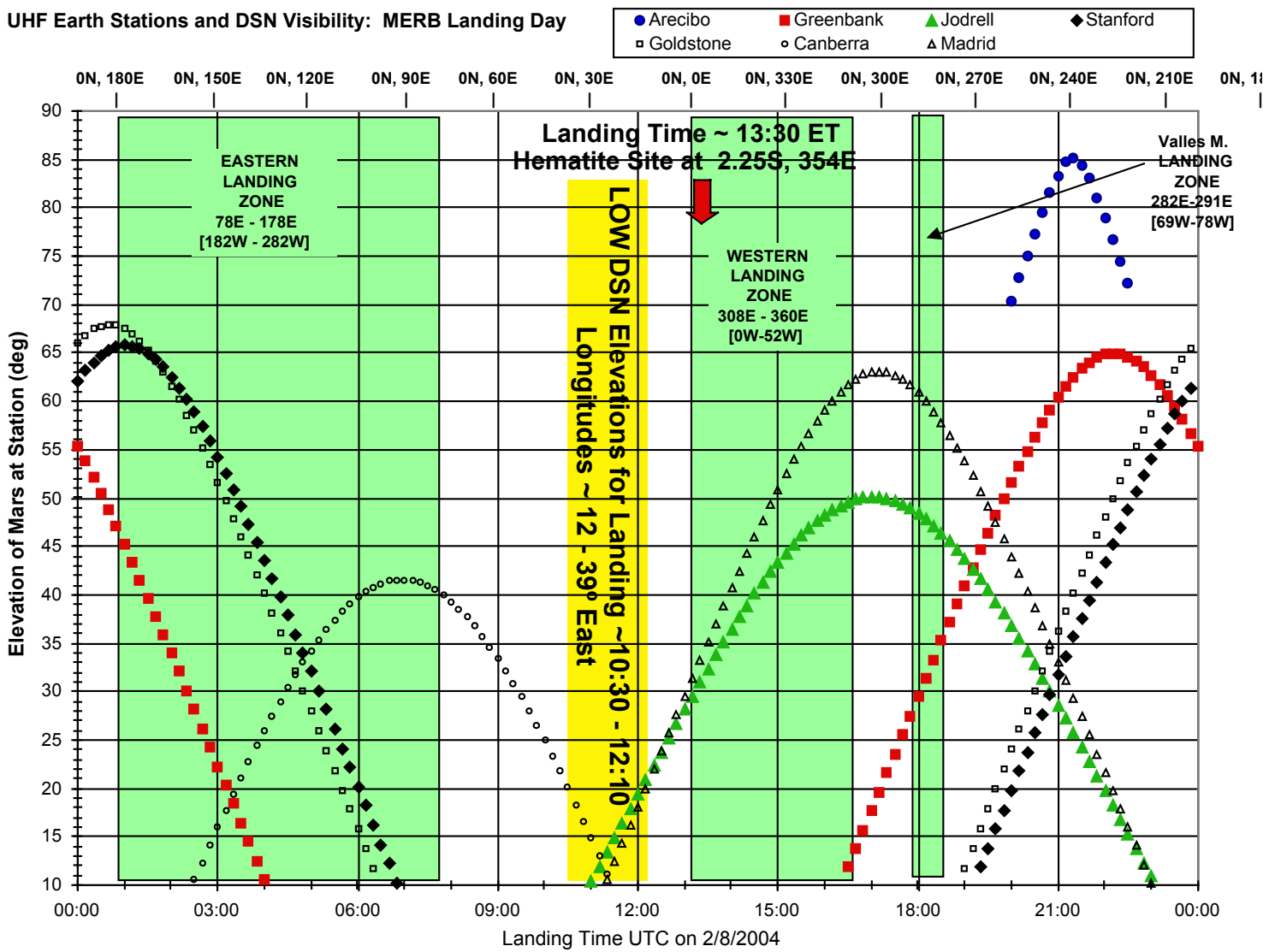
# Tracking Station Elevations for MER-A Arrival

Mars Exploration Rover



# Tracking Station Elevations for MER-B Arrival

Mars Exploration Rover



# MER DSN Support (1)

- **MER Mission Considerations that drive DSN Request and DSN Capabilities**
  - **Telecom capability.**
    - MPF was first mission to use Maximum-likelihood Convolutional Decoder 3 for 15, 1/6 decoding; MER missions also need increased downlink capability using MCD3.
    - 34m HEFs provide needed ranging data while not compromising downlink rates. (if BWG 20 kW transmitter upgrade is approved, MERs could possibly use either 34m HEF or BWG)
    - At maximum Earth range, some 70m required to support Mars Approach and EDL preparation.
  - **ΔVLBI measurements and tests**
    - Require ΔVLBI Science Receivers, at 2 DSN sites concurrently.
  - **EDL semaphores and tests**
    - Require Radio Science Receivers; probably require arrayed 70m and 34m.
- **MER DSN Requests considered two MERs, other Mars-view missions**
  - **As possible, events were staggered between two MERs to avoid oversubscribing DSN.**
  - **Moved MER events away from Contour flyby 11-12-03.**
  - **MER Approach phases include only essential events to minimize conflicts.**
    - Mars Odyssey (in Mars orbit), THEMIS II science campaign (October 2003 - August 2004).
    - Concurrent Mars approaches by Mars Express Orbiter (MOI 12-26-03) and Nozomi (MOI 1-1-04).

# MER DSN Support (2)

- **MER DSN Requests will Evolve**
  - **As hardware design matures, Mission design will incorporate capability changes.**
    - Expect some increased requests, some decreases, and rescheduling of events.
- **MER Landing Site Selection Plans**
  - **One year before Launch, Science will select 15° longitude by 10º latitude "boxes"**
    - Narrows viewperiod timing uncertainty to about 1 hour.
    - Identified in June 2002, for Landings on January 4 2004 and February 8 2004.
    - Therefore, incorporate into viewperiods for the August 2002 and February 2003 RARBs.
      - Note: current viewperiod definition does not model landing site; should MADB/TMOD develop this viewperiod modeling for landed missions?
  - **In April 2003, Science will select the two landing sites.**
    - Perhaps plan special study in May 2003 to assess impact of Landing sites given that the August 2003 RARB may not address early 2004 issues.
    - May recommend beginning scheduling process at least 6 months before Landing (June 2003, after launches), since early 2004 timeframe is already known to be very tightly contested for DSN assets.

# Summary of MER DSN Request

Mars Exploration Rover

| MER Event / Duration | Amount / Type of DSN Support | Purpose of Requested DSN |
|---|---|---|
| Launch to L + 30 days<br>(30 days) | Continuous 34m;<br>plus 1/week ΔVLBI: 1hour 2-site track start week 25, require VSRs | - Post-Launch health: uplink, downlink, RadioNav data for TCM-1 |
| TCM-1, 2, 3, 4<br>(6 days each) | Continuous 6 days centered on TCM, including 70m track for the burn window. | - Pre- and post-burn RadioNav data from all sites; uplink TCM and track data.<br>- 70m provides comm during TCM-1 offpoint. |
| Busy Cruise<br>(approx. 11 weeks) | 2 34m/day on average.<br>1/week ΔVLBI: 1hour 2-site track<br>semaphore tests: 70m+34m array | - Uplink and downlink for EDL and surface-preparation tests. Typically performed twice: soon after launch, and repeated just before Approach<br>- Semaphore, Instrument, ΔVLBI, Navigation and Telecom tests. |
| Minimum Cruise<br>(approx. 8 weeks) | 3 tracks per week (last 3 weeks 5-7/ wk due to MER-B Earth range)<br>1/week ΔVLBI: 1hour 2-site track | - At least 1 track from all 3 DSN sites every 10 days.<br>- Gaps between tracks no longer than 3 days, no shorter than 1.5 day.<br>- Maintain radioNav data; sequence up link and spacecraft telemetry downlink. |
| Approach (Entry - 45d to Entry)<br>(45 days) | Continuous 34m HEF or 70m<br>2/week ΔVLBI: 1hour 2-site tracks | - High-quality radioNav to design TCM-4 and TCM-5.<br>- Quick awareness of and recovery from any anomaly, to assure success of EDL. (Earth more distant, so HEFs or 70m probably required). |
| Entry - 4d to Landing<br>(4 days) | Continuous 70m<br>arrayed 70m+34m for EDL | - Critical event with high accountability.<br>- Uplink TCM-5; burn at Entry - 12 hours; assess success of burn.<br>- Quick awareness of and recovery from any anomaly, to assure success of EDL.<br>- 70m+34m arrayed tracking needed for semaphore reception at EDL attitudes. |
| 91-sol surface ops<br>(approx. 93 days) | 1 70m per day, during Mars daytime | - Earth view depends on landing site (15°-wide box selected 1 year before Launch).<br>- Daily uplink of sequences, downlink results.<br>- Quick awareness of and recovery from any anomaly, to assure that mission science requirements are met (required number of soil and rock targets, images and other Science data). |

# *Backup Slides*

# Additional Science

*The MER science payload allows significant additional science to be done*

- Atmospheric science:
  - Mini-TES spectra of the sky yield vertical temperature profiles in atmospheric boundary layer.
  - Pancam images of the sun yield atmospheric opacity.
  - Pancam images of the sky yield aerosol scattering properties.
- Thermophysical properties:
  - Mini-TES rock/soil temperatures at multiple times of day yield thermal inertia.
- Magnetic properties:
  - Magnets can be used to separate magnetic phases from aerosols, allowing them to be studied with in-situ instruments.
- Strength properties:
  - RAT engineering data (*e.g.*, grinding motor current *vs.* depth) yield information on rock strength.
  - Imaging of trenches dug with rover wheels yield information on soil shear strength.

# How MER Will "Follow the Water"

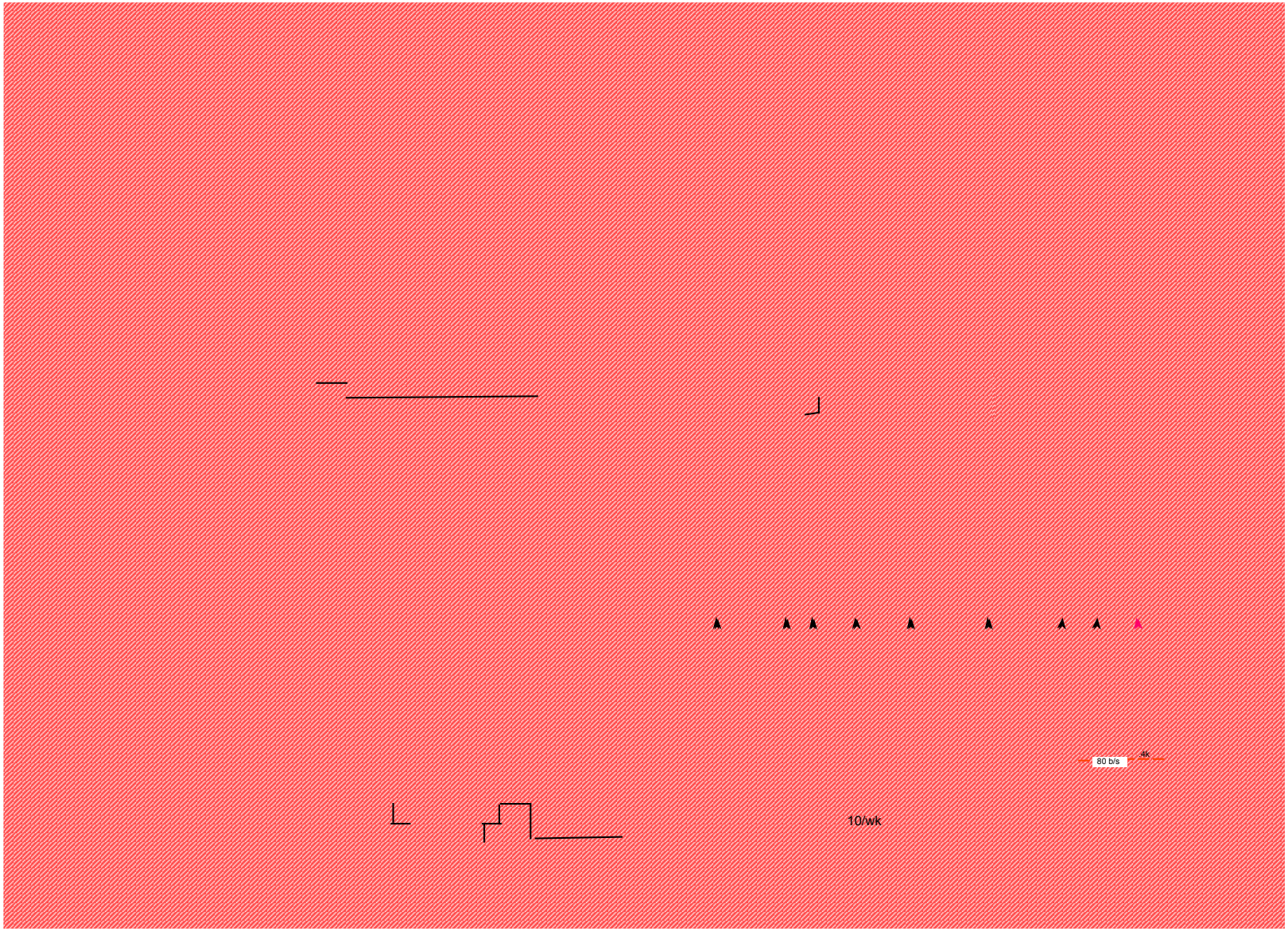
JPL

Mars Exploration Rover

- Choose a landing site with strong evidence for past liquid water.
- Study morphologic features, both large and small, that result from the action of liquid water:
  - Sedimentary layers
  - Erosional and depositional landforms
  - Rounded grains, size sorting of grains, *etc*.
- Study rocks and soils that hold clues to past water activity:
  - Minerals precipitated from water (evaporites, carbonates, *etc*.)
  - Water-bearing minerals (*e.g*., clays, gypsum, goethite)
  - Hydrothermal alteration minerals.
  - Minerals produced by chemical weathering in the presence of water.
- Put these water-related measurements into a broader geologic context, using imaging, IR remote sensing and the rover's ability to move.
- Use this reading of the site's geologic record to understand the environmental conditions when liquid water was present, and to assess whether they were conducive for life.

# Flight Activity Timeline





# Cruise Phase Activities

- **Post-Launch Spacecraft Checkout**
- **Science / Instrument Checkout**
  - Reference (dark-field) images for cameras (Pancam, MI, Hazcams, and Navcams), reference spectra for APXS/Mössbauer/mini-TES, plus engineering health data (in early and late cruise).
- **Spacecraft Attitude Maneuvers to Maintain Earth/Sun Pointing**
  - Performed periodically (10-15 times) throughout the Cruise Phase.
- **Trajectory Correction Maneuvers (TCMs)**

| Maneuver | Time* | Data Cutoff | Description |
|---|---|---|---|
| TCM-1 | L + 15 days | L + 10 days | Correct injection errors; Remove injection bias |
| TCM-2 | L + 60 days | L + 55 days | Correct TCM-1 errors; Target to entry aimpoint |
| TCM-3 | E - 60 days | E - 65 days | Correct TCM-2 errors, Target to entry aimpoint |

* TCM locations subject to change based on ongoing analysis and to avoid conflicts between MER-A and MER-B.

- **EDL Semaphore Tests**
  - Telecom tests performed in early cruise (near Earth) and again in late cruise (larger Earth range).
- **ACS / Navigation Calibration and Characterization**
  - Tests to calibrate non-gravitational trajectory perturbations due to ACS events in early cruise.
  - Tests of acquisition of complementary navigation data type (ΔDOR) in early cruise and late cruise.
- **MOS/GDS Activities: EDL / Surface Operational Readiness Tests**

# Approach Phase Activities

- **Shift focus of activities to EDL.**
  - **Minimize activities except for Navigation and EDL preparation.**

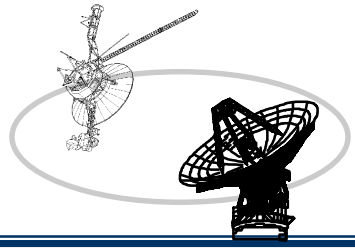
- **Trajectory Correction Maneuvers (TCMs)**

| Maneuver | Time | Data Cutoff | Description |
|---|---|---|---|
| TCM-4 | E - 10 days | E - 15 days | Correct TCM-3 errors. Vector mode. |
| TCM-5 | E - 12 hours | E - 18 hours | Final entry targeting maneuver. Vector mode. Select from library of tested ΔVs. |

# Detailed Summary of MER DSN Request

Mars Exploration Rover

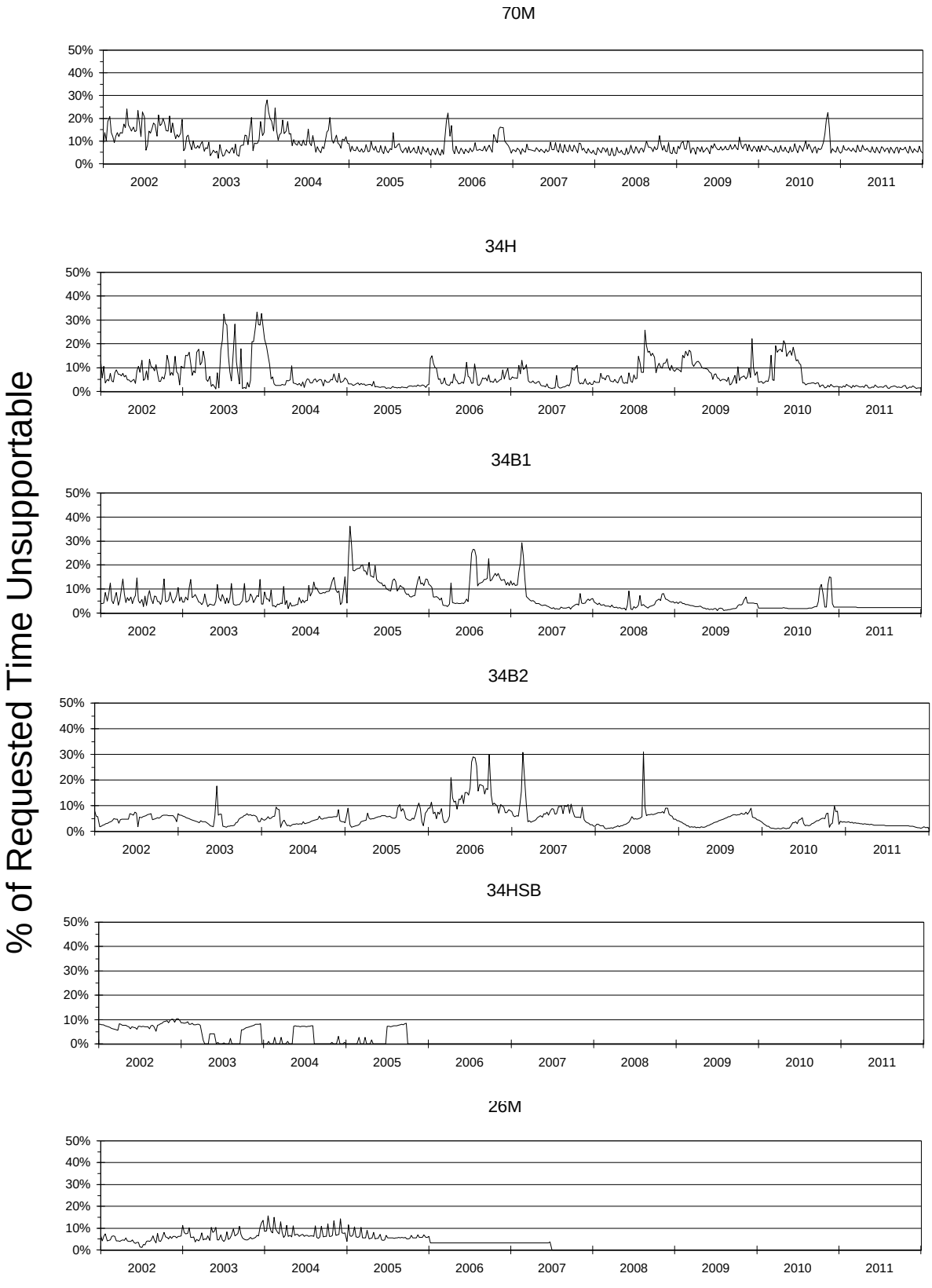
| MER Event / Duration | Amount / Type of DSN Support | Purpose of Requested DSN |
|---|---|---|
| Launch to L + 30 days | Continuous 34m;<br>plus 1/week ΔVLBI: 1hour 2-site track start week 25, require VSRs | - RadioNav data to determine post-launch state, for TCM-1 design.<br>- Downlink of post-launch critical events (e.g. power state, comm state).<br>- Uplink of post-launch despin, attitude correction sequences; downlink results.<br>- Uplink of spacecraft and instrument initial checkouts; downlink of checkout data |
| TCM-1, 2, 3, 4 ± 3 days | Continuous, including 70m tracking for the burn window. | - RadioNav data from all sites to determine pre- and post-burn states accurately<br>- Uplink of TCM commanding; downlink of post-burn telemetry.<br>- 70m provides comm during TCM-1 offpoint; better radioNavigation data; faster, less-risky uplink and downlink; practice with 70m configuration. |
| Busy Cruise<br>(approx. 11 weeks) | 2 34m/day on average.<br>plus 1/week ΔVLBI: 1hour 2-site track<br><br><br><br>semaphore tests:70m+34m array | Uplink and downlink for special tests. Typically performed twice: soon after launch, so any required adjustment to test results can be made; and repeated just before Approach, to characterize expected performance at conditions more like real EDL and surface ops:<br>- High-downlink volume instrument checkout (A: weeks 25 and 43; B: weeks 30 and 47)<br>- ACS/Nav performance characterization (weeks 23, 27)<br>- ΔLBI tests: test Mars reference and different techniques (weeks 28-29, 33, 42, 48)<br>- Semaphore tests using 70m with RSRs (A: weeks 32 and 44; B: weeks 37 and 49) |
| Minimum Cruise<br>(approx. 8 weeks) | 3 tracks per week<br>(last 3 weeks 5-7/ wk due to MER-B Earth range)<br>plus 1/week ΔVLBI: 1hour 2-site track | At least 1 track from all 3 DSN sites every week.<br>Gaps between tracks no longer than 3 days, no shorter than 1.5 day.<br>- Maintain radioNav data; provide sequence uplink and spacecraft telemetry downlink. |
| Approach<br>(Entry - 45d to Entry) | Continuous 34m HEF or 70m<br>plus 2/week ΔVLBI: 1hour 2-site tracks. | - High-quality radioNav to design TCM-4 and TCM-5: command, track, evaluate critical entry burns (Earth more distant, so HEFs or 70m probably required).<br>- Uplink of sequences, downlink results.<br>- Quick awareness of any anomaly; fast determination of cause, and rapid recovery. Required to assure success of EDL. |
| Entry - 4d to Landing | continuous 70m, with<br>arrayed 70m+34m for EDL | - Critical event with high accountability.<br>- Uplink TCM-5, assess success of burn through off-Earthpoint burn attitude.<br>- Quick awareness of any anomaly; fast determination of cause, and rapid recovery. Required to assure success of EDL.<br>- 70m+34m arrayed tracking needed for semaphore reception at EDL attitudes. |
| 91-sol surface ops<br>(approx. 93 days) | 1 70m per day, during Mars daytime | Earth view / track time depends on landing site (15°-wide box selected 1 year before Launch<br>- Daily uplink of sequences, downlink results.<br>Quick awareness of any anomaly; fast determination of cause, and rapid recovery.<br>Required to assure that mission science requirements are met (required number of soil and rock targets, images and other Science data). |



# RESOURCE CONTENTION SUMMARY

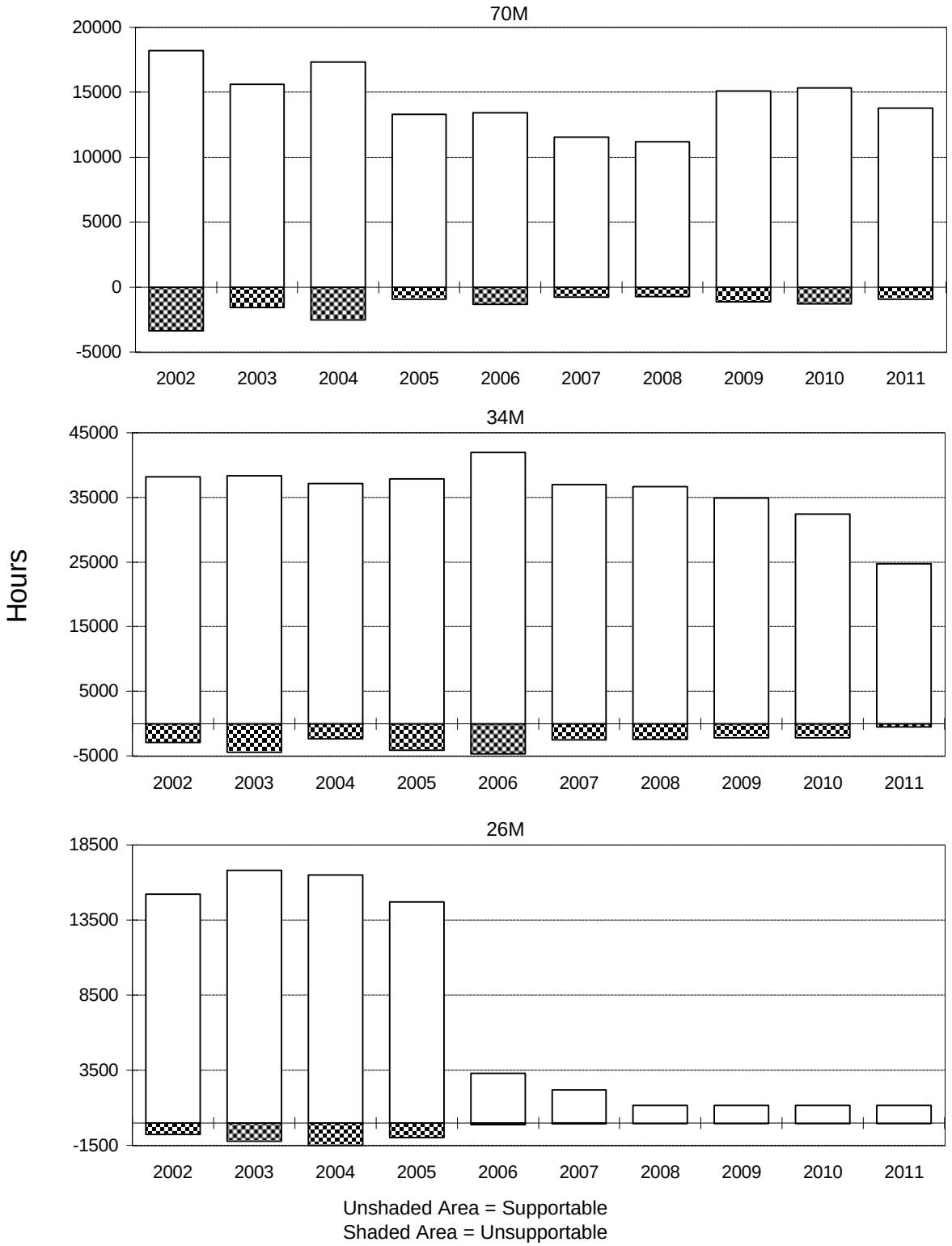
*Gene Burke*

# Projected Lost Time Summary




$$\text{Projected Lost Time} = \frac{\text{Expected Lost Time}}{\text{Total Requested Resource Usage Time}}$$

# Projected Yearly Supportable Time Summary
# 2002 - 2011



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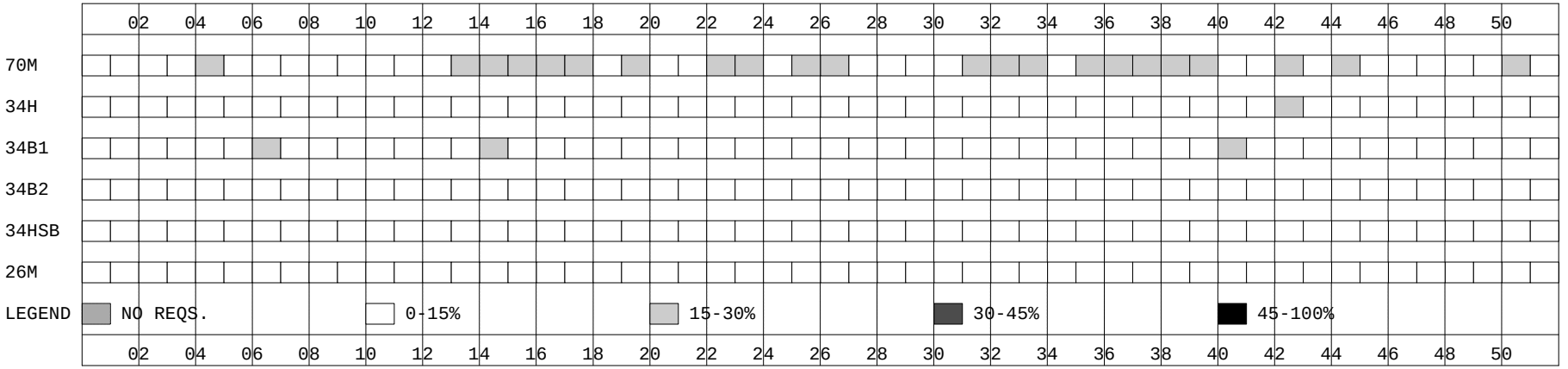
# 2002 DSN Subnet Contention



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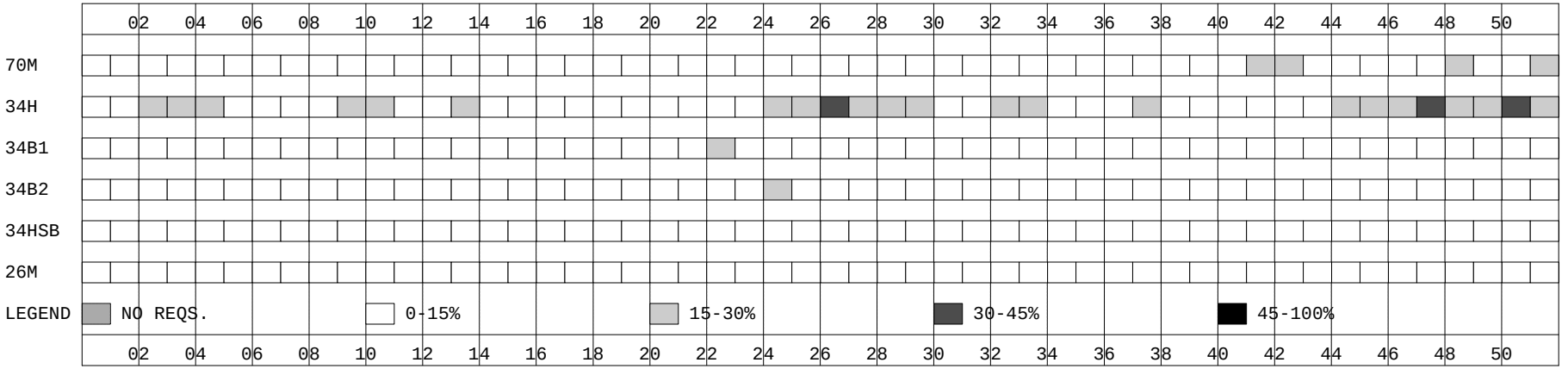
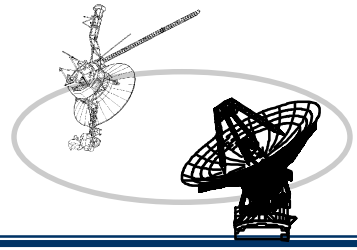
# 2003 DSN Subnet Contention



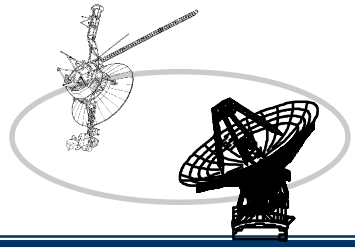


# RESOURCE CONTENTION "RED BOOK"

## Available at:

## http://rapweb.jpl.nasa.gov

*Bill Hincy*



# CONTENTION RESOLUTION

JPL

*Gene Burke*

*13 February 2001 RARB*

# CONTENTION RESOLUTION

## 2002 Contentions:

***Contention Period # 1A  2002 Week 04; 70M***

- DSS Maintenance agreed to reduce DSS-14 and DSS-63 routine support to 8 hours at each antenna to aid Nereus asteroid observation and Mars Odyssey transition to mapping.
- Ground Based Radio Astronomy agreed to delete Planetary Radio Astronomy support at DSS-14, to reduce Microwave Spectroscopy supports to 4 hours each, and to schedule Host Country support in three 8–hour increments.
- Galileo agreed to reduce routine support to one 8–hour and thirteen 5–hour passes.
- Mars Odyssey agreed to schedule three 5–hour passes on the 34HEF subnet while maintaining continuous mapping support.
- Microwave Anisotropy Probe (MAP) will use DSS-43, 63 for requested support.
- Space VLBI agreed to reduce support to 4 hours and will use DSS-43, 63.
- Goldstone Solar System Radar, Voyager 1 and Voyager 2 should receive their requested support in this period.

***Contention Period # 1B  2002 Weeks 05–09; 70M***

- The DSN agreed to reduce antenna calibrations to 4 hours each.
- DSS Maintenance agreed to reduce DSS-14 to one routine support in weeks 06 and 09 to aid Galileo, Nereus asteroid observation and Mars Odyssey.
- European VLBI Network will reduce support to 12 hours and move from week 05 to week 08.
- Ground Based Radio Astronomy will receive requested VLBA WCB support in week 06. To relieve contention at DSS-14, Ground Based Radio Astronomy agreed to reduce the average duration for Planetary Radio Astronomy and Microwave Spectroscopy support to 4-6 hours and to move RA500 WCB support from week 05 to week 08 using two 12–hour supports in that week.
- Galileo agreed to reduce routine support pass duration to 5 hours.
- Mars Odyssey will receive requested support using seven split passes.
- Space VLBI agreed to reduce support duration to 6 hours in weeks 06-08.
- Voyager 2 should receive their requested uplink support but agreed to reduce routine support pass duration to 5 hours in weeks 06 and 07.
- Gravity Probe–B, Goldstone Solar System Radar, MAP, and Voyager 1 should receive their requested support in this period.

***Contention Period # 2  2002 Weeks 10–27; 70M***

- DSS Maintenance agreed to move the 72–hour bearing regrout from week 23 to week 12 and to use 2 hours off–shift maintenance for DSS-14 support in this period and for DSS-63 support in weeks 23, 24, 26, and 27.

- European VLBI Network support will be reduced to 12 hours and moved from week 16 to week 23.

- Ground Based Radio Astronomy should receive requested Host Country and RA500 WCB support using three 8–hour supports for each event and will reduce Radio Stars WCB support to 8 hours, Planetary Radio Astronomy and Microwave Spectroscopy support to 4-6 hours.

- Galileo agreed to reduce support in weeks 10–15 to seven 8–hour and four 4–hour passes. Galileo also agreed to reduce support in weeks 16–23 and 25–27 to seven 8–hour passes but objected to the support reduction in week 24, indicating the need for 16 additional hours to support a maneuver.

- Mars Odyssey agreed to work reciprocal time off–line with Galileo to resolve contention in week 24. Additionally, Mars Odyssey agreed to use twelve 8–hour and four 4–hour passes in weeks 10–15 and will reduce three passes each week to 4 hours in weeks 16–27 to aid DSS Maintenance and Galileo.

- Goldstone Solar System Radar and MAP should receive requested support in this period.

***Contention Period # 3  2002 Weeks 29–39; DSS-14***

- DSS-14 NSP/70M servo drive upgrade downtime (DOY 196–272) was approved. DSS-14 routine and bearing maintenance will be deleted in this period.

- DSS Maintenance agreed to reduce DSS-63 to one weekly 8–hour support to aid 70m users. Antenna calibrations will use DSS-43, 63 for requested support.

- European VLBI Network support was reworked after the RARB and it was determined and agreed that routine support will move from week 30 to week 37 using 12 hours at DSS-63 only and the week 38 calibration will move to 40.

- It was discovered after the RARB that the 3-station Gravity Probe-B quarterly epoch planned in week 37 was omitted from this contention period. To correct the error Gravity Probe-B has agreed to move from week 37 to week 28.

- Ground Based Radio Astronomy agreed to delete DSS-14 Microwave Spectroscopy and Planetary Radio Astronomy support in this period. They also agreed to reduce Radio Stars to 12 hours, moving support from weeks 33 and 39 to weeks 28 and 40 and to move weeks 32 and 36 VLBA WCB support to weeks 28 and 41.

- Galileo agreed to use DSS-43, 63 in weeks 29–30 and in weeks 31–39 to reduce support to six, 5-6 hour passes/week using DSS-63. Galileo indicated a need for one pass at DSS-43 each week. Mars Odyssey agreed to work off–line to resolve Galileo's request.

- Goldstone Orbital Debris Radar agreed to move support from weeks 30, 32, and 34 to weeks 46, 47, and 48.

- Goldstone Solar System Radar agreed to delete Mercury observations in this period but requested that the deleted support be reinstated if the downtime plan should change. Mars Odyssey agreed to change their requested support in this period to six 9–hour passes using DSS-43 and five 5–hour passes using DSS-63.

- MAP and Space VLBI agreed to use DSS-43, 63 for their requested support.

- Voyager 1 agreed to use DSS-43, 63 for uplink support and to use DSS-24 or 25 for MAGROL support in weeks 31 and 38. Voyager 1 noted a preference for MAGROL support using a 34HEF antenna.

- Ulysses agreed to use DSS-24 for their requested support in this period.

***Contention Period # 4 2002 Weeks 40–47; 70M***

- DSS Maintenance agreed to reduce DSS-14 and DSS-63 routine maintenance to one 8-hour support at each site in this period.

- Ground Based Radio Astronomy agreed to use two 12–hour supports for each Host Country and RA500 WCB and to reduce Planetary Radio Astronomy and Microwave Spectroscopy supports to 4–6 hours.

- Galileo should receive requested encounter support in weeks 44 and 45. Galileo objected to the recommendation to reduce routine support in weeks 40–44, 46, and 47 to six 4–hour passes/week, indicating a need for additional time before and after their encounter to uplink sequences, commanding and playback. Mars Odyssey agreed to work off-line with Galileo to possibly satisfy the request.

- Mars Odyssey agreed to change their support request in this period to eleven 8–hour and six, 4–hour passes/week.

- Voyager 1 agreed to use DSS-15 for MAGROL support in week 44.

- Goldstone Solar System Radar and Ulysses should receive requested support in this period.

***Contention Period # 5 2002 Week 48–2003 Week 06; 70M***

- DSS-43 NSP and 70M servo drive downtime (DOY 329–040) was approved.

- DSS Maintenance agreed to reduce DSS-14 and DSS-63 routine maintenance to one 8-hour support at each site in this period.

- DSN antenna calibrations will receive requested support using DSS-14 and 63.

- European VLBI Network support was reworked after the RARB and it was determined and agreed to move routine support from week 04 to week 21.

- Ground Based Radio Astronomy agreed to delete Microwave Spectroscopy support scheduled at DSS-43 and reduce DSS-14 and DSS-63 support to 7 hours.

- Host Country will move from week 04 to week 22 and the RA500 WCB will move from week 02 to week 24.

- Radio Stars and VLBA WCB will receive requested support.

- Galileo agreed to reduce support in weeks 48–52 to nine 8–hour and two 4–hour passes/week using DSS-14, 63. Galileo also agreed to use DSS-14 and 63 for requested support in 2003 weeks 01–03.

- Goldstone Orbital Debris Radar agreed to move support in weeks 01 and 03 to weeks 25 and 27 and will receive requested support in week 05.

- Gravity Probe–B agreed to move arrayed support in 2002 week 06 to 2002 week 47.

- Goldstone Solar System Radar agreed to reduce Mercury supports in 2003 weeks 02–04 to 4 hours each.

- Mars Odyssey should receive requested support, in 2002 weeks 48–52 using DSS-14, 63.

- MAP will use DSS-14, 63 for routine support and DSS-14, 34, 63 for maneuver support in this period.

- Nozomi should receive requested support using DSS-34 and Space VLBI will use DSS-14, 63.

- Ulysses agreed to use two 5-hour passes at DSS-24, 54 for requested support.

- Voyager 1 agreed to use DSS-14, 63 for routine uplink support and will replace negotiated 70M support with one daily 4-hour pass at DSS-25 in week 51 and DSS-15 in weeks 52–06.

- Voyager 2 agreed to delete uplink support, to use DSS-45 for week 51 MAGROL, and to reduce negotiated support to six 4–hour passes using DSS-45 in this period.

***Contention Period # 6 2002 Weeks 23–27; 34HEF***

- Cassini agreed to reduce 2 passes/week to 4 hours in weeks 24–27.

- DSS Maintenance agreed to reduce DSS-45 and 65 support to 4 hours in weeks 24–27.

- Comet Nucleus Tour (CONTOUR) and Mars Global Surveyor should receive their requested support in this period.

***Contention Period # 7 2002 Weeks 29–39; 34HEF***

- DSS-15 NSP downtime in week 31–39 (DOY 213–270) was approved.

- DSS-15 Maintenance will be deleted during the downtime period.

- Cluster 2 agreed to use DSS-16/24/27 for arrayed support.

- CONTOUR should receive requested launch support, replacing DSS-15 with DSS-25 and 26.

- After the RARB the DSN agreed to delete CAT M&E support in weeks 35 and 36 Clock Sync VLBI support will be deleted. The DSN objected to the loss of support and has the problem under advisement.

- Goldstone Orbital Debris Radar support was reworked after the RARB and it was determined and agreed to move support from weeks 30, 32, and 34 to weeks 48, 50 and 52.

- Mars Global Surveyor and Stardust should receive requested support using DSS-45 and 65.

- The Space Geodesy Program agreed to reduce Crustal Dynamics support to 12 hours.

- Space Infrared Telescope Facility (SIRTF) should receive requested launch support, replacing DSS-15 with DSS-25. It was noted that SIRTF should have priority for DSS-25 usage during this period.

- Ulysses agreed to move their support to DSS-24.

- Voyager 1 agreed to delete support at DSS-65 and use planned support at DSS-25 and 26.

- Cassini, Ground Based Radio Astronomy, and Voyager 2 should receive their requested support in this period.

***Contention Period # 8 2002 Weeks 40–47; DSS-45***

- DSS-45 NSP downtime (DOY 274–326) was approved. DSS-45 maintenance will be deleted during the downtime period.

- CONTOUR is to receive requested support using DSS-15, 43, 65.

- After the RARB the DSN agreed to delete CAT M&E support in weeks 41 and 42 and to use DSS-15\65 in week 47.

- Ground Based Radio Astronomy agreed to reduce Host Country to three 12–hour supports and to move from weeks 42, 43, and 47 to weeks 48, 49 and 50.

- Mars Global Surveyor will use DSS-15 and 65 for their requested support.

- Stardust agreed to use DSS-15, 65 for their requested support alternating with 4 hours at DSS-43 every other week.

- Space Geodesy Program agreed to delete support in this period.

- SIRTF agreed to use DSS-15, 25, 34, and 65 for their requested support.

- Voyager 2 agreed to reduce their 16–hour passes to 8 hours and to move all support in this period to DSS-34 and 43.

***Contention Period # 9 2002 Week 49–2003 Week 06; DSS-65***

- DSS-65 NSP downtime (DOY 336–040) was approved. DSS-65 maintenance will be deleted during the downtime period.

- Cassini begins their Gravity Wave experiment in week 51 and should receive the requested continuous support using seven 6–hour passes at DSS-54.

- Clock Sync support will be deleted with the loss of this support under DSN advisement.

- The DSN agreed to delete CAT M&E support in 2003 week 05 and 06.

- Mars Global Surveyor agreed to reduce support to 7–hour passes and will MSPA with Mars Odyssey at DSS-25, 34, 63.

- Mars Odyssey will receive requested support using DSS-25, 34, 63 and has agreed to MSPA with Mars Global Surveyor 3-4 passes/week.

- Rosetta will receive their requested launch support in weeks 05 and 06 using DSS-54.

- Stardust will use DSS-15, 45 for their requested support in week 49-50 and 01-06.

- Space Geodesy Program agreed to delete Crustal Dynamics support.

- SIRTF agreed to use DSS-15, 45 in weeks 49–52.

- Voyager 1 agreed to reduce to 4–hour passes in week 49–50 and will move support to DSS-15

***Contention Period # 10 2002 Weeks 40–47; 34BWG1***

- DSS-24 and DSS-54 NSP downtime (DOY 274–326) was approved. DSS Maintenance at these stations will be deleted during the downtime period.

- Advance Composition Explorer (ACE) will move support to DSS-16, 66.

- Chandra will receive requested support using DSS-34, 27, 16 and 66.

- Cluster 2 will use DSS-16/27/15 for their arrayed support in weeks 40 and 44.

- Genesis agreed to use DSS-34 for their routine support and to move their week 41 maneuver to week 39.

- The International Gamma Ray Astrophysics Laboratory (INTEGRAL) agreed to use DSS-16 in weeks 41 and 45 for their requested support.

- Nozomi agreed to reduce routine support to 6 hours/pass, retaining one 8–hour pass in each of weeks 46 and 47, and will move to DSS-14 and 63.

- Solar and Heliospheric Observatory (SOHO) agreed to move the week 45 TSO to week 52 and to scheduling two 4–hour passes at DSS-16 and two at DSS-27 in that week.

- SIRTF will receive requested support using DSS-15, 25, 34, and 65.

- Ulysses agreed to delete support on the 34BWG1 and schedule seven 4–hour passes on the 70M and seven 6–hour downlink passes at DSS-15, 65. Ulysses noted that they require 20 to 30 minutes of overlap between the split passes.

- Voyager 1 agreed to reduce negotiated and routine support to 4 hours each and will move support to DSS-25 and 65.

- Wind should receive requested support using DSS-34.

***Contention Period # 11 2002 Weeks 23–27; DSS-25***

- Cassini objected to reducing one pass/week to 4 hours and stated they wanted maintenance to use off-shift hours. DSS Maintenance agreed to use weekly 6-hour supports to aid Cassini in this period. After the RARB Cassini agreed to reduce 1 pass/week to 4 hours in weeks 23, 24, 26, and 27. A counter proposal to resolve the remaining contention in week 25 will be worked off-line.

***Contention Period # 12 2002 Week 40–2003 Week 13; DSS-26***

- DSS-26 NSP Test and Training (DOY 274-089) was approved. DSS maintenance support will be deleted.

- Voyager 1 agreed to delete support at DSS-26 in weeks 40-06 and to reduce support to 4-hours using DSS-24 in weeks 07-13.

***Contention Period # 13  2002 Weeks 40–47; DSS-27***

- ACE should receive the requested support in this period.
- DSS Maintenance agreed to reduce weekly support to 6 hours.
- SOHO agreed to move their week 41 TSO to week 39.
- Changes to support in this period were made for users moving to DSS-27 as a result of DSS-24, 45, and 54 NSP downtime and the TDRS launch planned on the 26M in weeks 40-43.

***Contention Period # 14  2002 Weeks 40–47; 26M***

- ACE should receive requested support using DSS-16, 66.
- DSS Maintenance agreed to use weekly 6 hours supports at each antenna.
- SOHO will move their week 41 and 45 TSO supports to weeks 39 and 52.
- INTEGRAL and the TDRS launch should receive their requested support in this period.
- Changes to support in this period were made for the TDRS launch, and users moving to the 26M subnet as a result of DSS-24, 45, and 54 NSP downtime.

## 2003 Contentions:

***Contention Period # 15  2003 Weeks 07–16; DSS-63***

- DSS-63 NSP/70M servo drive upgrade downtime was approved. DSS Maintenance agreed to reduce DSS-14 to one 8-hour weekly routine support. DSS-63 maintenance will be deleted in this period. Antenna calibrations should receive requested support using DSS-14, 43.
- European VLBI Network support was reworked after the RARB and it was determined and agreed to move routine support from week 16 to week 21 and to delete the calibration in week 11.
- Ground Based Radio Astronomy agreed to move support for Host Country from week 15 to week 17, to delete DSS-63 Microwave Spectroscopy support in this period and VLBA WCB support in week 10 and 14. It was also agreed to move RA500 WCB support from week 14 to week 05 and move Radio Stars support from weeks 07 and 13 to weeks 06 and 18.
- MAP agreed to move their maneuver from week 14 to week 17 and to use DSS-14, 43 for routine support.
- Space VLBI agreed to use DSS-14, 43.
- Voyager 1 will use DSS-14, 43 for routine uplink in this period.

***Contention Period # 16  2003 Weeks 39–40; 70M***

- Ground Based Radio Astronomy agreed to move RA500 WCB support from week 40 to week 36 and Radio Stars WCB from week 39 to week 37.

- Goldstone Solar System Radar should receive requested support in this period.

- Mars Odyssey agreed to use DSS-43 and 63 to accommodate the 1999CU3 asteroid observation and Ground Based Radio Astronomy activities.

- MAP agreed to move their week 40 maneuver to week 38.

- Mars Exploration Rovers A and B agreed to use DSS-15 and 65 for requested support to accommodate Mars Odyssey.

***Contention Period # 17 2003 Weeks 42–43; 70M***

- DSS Maintenance agreed to move the 72-hour bearing regrout from week 43 to week 35 to aid Mars Odyssey mapping.

- Ground Based Radio Astronomy agreed to move Host Country support from week 42 to week 35 and to reduce Microwave Spectroscopy and Planet Radio Astronomy supports to 4 hours.

- Goldstone Orbital Debris Radar agreed to delete support in week 42.

- Gravity Probe-B agreed to move support in week 43 to week 37.

- Mars Odyssey agreed to use DSS-14 and 63 for requested support to accommodate Mars Exploration Rover-A.

- Space VLBI agreed to reduce RADA support to 6 passes each week.

- Voyager 2 agreed to use DSS-43 for requested uplink and DSS-34 for negotiated support.

- MAP, Mars Exploration Rover-A, Mars Exploration Rover-B, Nozomi, and Voyager 1 should receive requested support in this period.

***Contention Period # 18 2003 Weeks 07–16; 34HEF***

- The DSN agreed to delete CAT M&E support in weeks 08 and 09 and Ground Based Radio Astronomy agreed to reduce Host Country support to 8 hours to aid Cassini, Mars Odyssey, and Rosetta.

- Mars Global Surveyor agreed to reduce support to 8 hours/pass and to move 4-5 passes/week to DSS-14, 43 to aid Mars Odyssey.

- The Space Geodesy Program agreed to the requested Crustal Dynamics support using two 12-hour increments to aid Cassini, Mars Odyssey, and Rosetta.

- DSS Maintenance will be routinely performed and Cassini, Mars Odyssey, Rosetta, and Stardust should receive requested support in this period.

***Contention Period # 19 2003 Week 25; 34HEF***

- Cassini agreed to reduce DSS-65 support to 5 hours/pass using DSS-54 to fill gaps in their requested conjunction support.

- Ground Based Radio Astronomy agreed to use DSS-43 for Host Country support.

- Stardust agreed to move their TCM support to the 70M.

- DSS Maintenance will be routinely performed and Mars Exploration Rover-A should receive requested support in this week.

***Contention Period # 20  2003 Weeks 26–29; 4HEF***

- Cassini agreed to reduce DSS-65 support to 5 hours/pass using DSS-54 to fill gaps in their requested conjunction support.

- Ground Based Radio Astronomy agreed to reduce Host Country support in week 29 to 8 hours.

- Mars Exploration Rover-A agreed to move their checkout and busy cruise support to the 70M.

- Stardust agreed to use DSS-26, 34, 54.

- Mars Exploration Rover-B should receive requested support for launch, maneuver, and spacecraft checkout in this period.

***Contention Period # 21  2003 Week 30; 34HEF***

- The DSN agreed to move CAT M&E support to week 32.

- Stardust agreed to use the 70M subnet for their requested TCM support.

- Voyager 1 agreed to use DSS-26, and Voyager 2 agreed to use DSS-43 for their negotiated support in this week.

- Mars Exploration Rovers A and B should receive their requested support.

***Contention Period # 22  2003 Weeks 33–34; 34HEF***

- Mars Odyssey agreed to use DSS-25, 34, 54 for requested support.

- Mars Exploration Rover-A agreed to use the 70M for their requested EDL test in week 34.

- Space Geodesy Program agreed to reduce DSS-45 Crustal Dynamics support to 12 hours.

- Voyager 1 agreed to delete support at DSS-15 and will use planned support at DSS-26.

- DSS Maintenance will be routinely performed and Cassini, CONTOUR, DSN Clock Synchronization, Mars Exploration Rover-B, Stardust, and SIRTF should receive their requested support in this period.

***Contention Period # 23  2003 Week 38; DSS-15, 65***

- Mars Exploration Rover-A agreed to move their minimum cruise support to the 70M.

- SIRTF agreed to use DSS-25, 34, 54 for their routine support.

- CONTOUR, Mars Exploration Rover-B, and Stardust should receive requested support in this week.

***Contention Period # 24  2003 Weeks 01–06; 34BWG1***

- DSS Maintenance agreed to use 2 hours off-shift maintenance at each site to aid Genesis, Rosetta launch operations, Ulysses, and Wind.
- Mars Odyssey agreed to use DSS-25, 34, 63 for requested mapping support.
- Ulysses should receive their requested datation support and agreed to split their routine support, using a daily 5-hour pass at DSS-24 and a downlink pass at DSS-15.
- Voyager 2 agreed to reduce support to 4-hour passes and will use DSS-45.
- Wind should receive requested support using DSS-24, and 34.
- Genesis, Nozomi, Rosetta, and SIRTF should receive requested support in this period.

***Contention Period # 25  2003 Weeks 07–14; DSS-34***

- DSS-34 NSP downtime was approved. Maintenance will be deleted during this period.
- Chandra agreed to use 2-hour passes at DSS-46.
- Genesis agreed to receive requested support using DSS-24 and 54. Nozomi agreed to use DSS-43.
- Mars Odyssey and SIRTF agreed to use DSS-43 and 45.
- Wind agreed to use DSS-24, 54.

***Contention Period # 26  2003 Weeks 07–14; DSS-25***

- DSS-25 NSP downtime was approved. Maintenance is deleted in this period.
- Cassini, Mars Odyssey, and SIRTF all agreed to use DSS-14, 15 for requested support. Note: DSS-15 is down for antenna controller replacement beginning week 10. DSS-14 will be used to replace DSS-25 from week 10-14.

***Contention Period # 27  2003 Weeks 25–28; DSS-25***

- Cassini objected to reducing one pass/week to 4 hours.
- DSS Maintenance agreed to reduce weekly support to 6 hours to aid Cassini in this period.
- After the RARB Cassini agreed to reduce one pass/week to 4 hours in weeks 25, 26, and 28.
- The remaining contention in week 27 will be worked off-line.

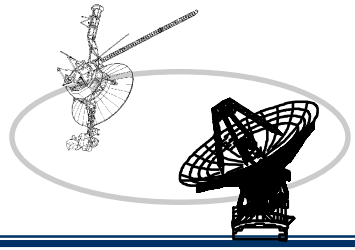
***Contention Period # 28  2003 Weeks 01, 05, 13, 17, 25, 29, 33, 37; 26M***

- DSS Maintenance agreed to reduce DSS-16 and 66 support to 4 hours in weeks 09, 13, and 17 to aid INTEGRAL and SOHO.
- INTEGRAL agreed to move 3 passes/week to DSS-24 in weeks 09, 13, 17, 25, 29, 33, and 37 to aid DSS-Maintenance and SOHO.

- SOHO agreed to delete their week 01 TSO and move the week 05 TSO to week 09.

- In weeks 09, 13, and 17 SOHO agreed to split five TSO passes using 4 hours at DSS-14 and 4 hours at DSS-16.

- In weeks 09, 13, 17, 25, 29, 33, and 37, SOHO agreed to split 2 routine passes/week using 4 hours at the 26M, and 4 hours at DSS-27, to aid DSS-Maintenance and INTEGRAL.



# ACTION ITEMS FROM 13 FEBRUARY 2001 RARB

*Gene Burke*

## *13 February 2001 RARB*

# Action Item Summary

| *AI#* | *CP#* | *Year* | *Month(s)* | *Week(s)* | *System* | *Responsible* | *Due Date* | *Status* |
|---|---|---|---|---|---|---|---|---|
| **01** | **N/A** | **2001** | **---** | **---** | **All** | **S. Kurtik** | **04/27/2001** | **Open** |

***ACTION:*** Network Simplification Project (NSP) will be eliminating the TRK-2-15A interface. Action is to investigate whether any changes to the GSFC-JPL ICD are needed, and to specifically verify that the Flight Dynamics Facility (FDF) at GSFC is aware of, or is not affected by this change.